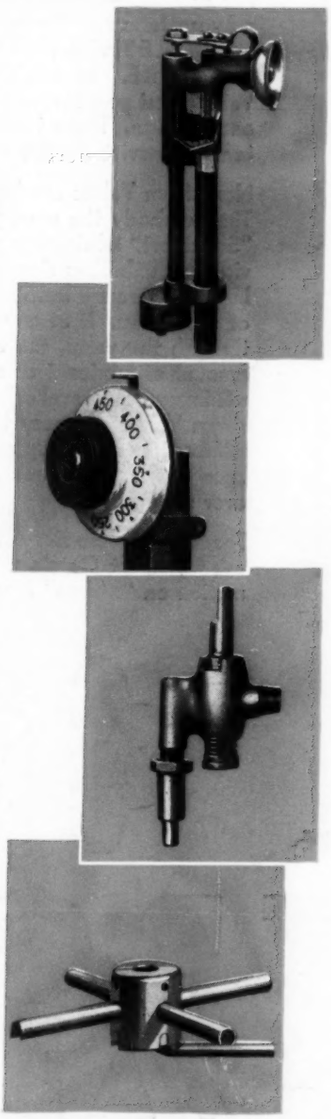
WESTERN GAS

March 1931

STANDARD ACCESSORIES FOR BOTTLED GAS (Propane, Butane) APPLIANCES



Whether it's safety pilots or heat controls, gas cocks or lighters . . . our line is complete for any propane or butane gas appliance need.

Every accessory is STANDARD . . . all are laboratory tested.

WRITE TODAY
FOR DETAILED INFORMATION

MILWAUKEE
GAS SPECIALTY CO.
MILWAUKEE

20 Cents the Copy

MAR 10 1931

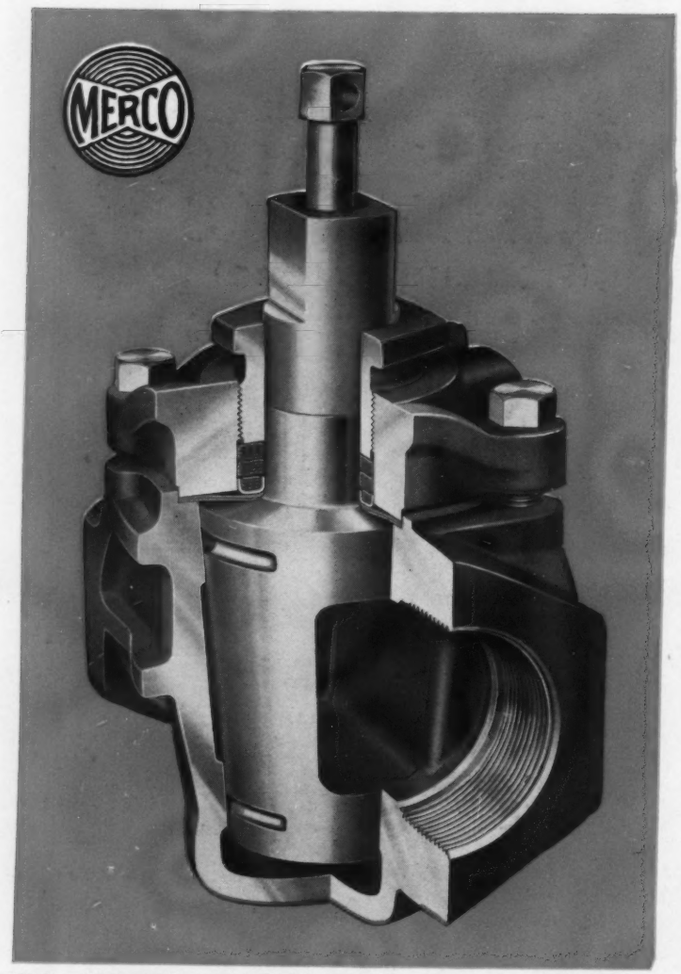
A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

PRINT IN BINDING

TESTED

. . . . . TO DOUBLE

WORKING PRESSURES



THE PERFECT APPLICATION OF A PRINCIPLE

Ordinary methods of valve making are not tolerated in the manufacture of Nordstrom Valves. For Nordstrom adds RIGID TESTS to quality materials, expert fabrication and advanced principles of design. The combination produces valves unequalled for general, all-around efficiency in every type of service.

For example—Nordstrom Valves are given a hydrostatic test for rupture that amounts to DOUBLE THE RATED COLD WORKING PRESSURE. In addition, all Nordstrom Valves must pass severe air tests for porosity and leakage. These tests assure the utmost in valve service for the operator.

Nordstrom Valves are kept free from leaks. They embody the new, patented hydraulic "Sealdport" lubricating principle. This provides an unbroken ring of special "Merco" Lubricant around both inlet and outlet ports of the valves. If at any time a leak occurs through the valve, the addition of a small amount of lubricant or a turn of the screw will immediately seal off the leakage. Nordstrom Valves are easy to turn because the lubricant exerts an upward pressure on the base of the plug, freeing the plug should it ever be tight.

For the complete story of Nordstrom Valves, ask for latest Catalog. Also ask for information on "Merco" Pipe Joint Compound.

Also
"Merco" Flanges

A new type of flanged joint for use with welded pipe lines requiring insertion of valves and fittings for the taking off of outlets. Extremely flexible. Sizes from 1½" to 10".

NORDSTROM VALVES

MERCO NORDSTROM VALVE COMPANY
SUBSIDIARY OF THE MERRILL COMPANY . . ENGINEERS

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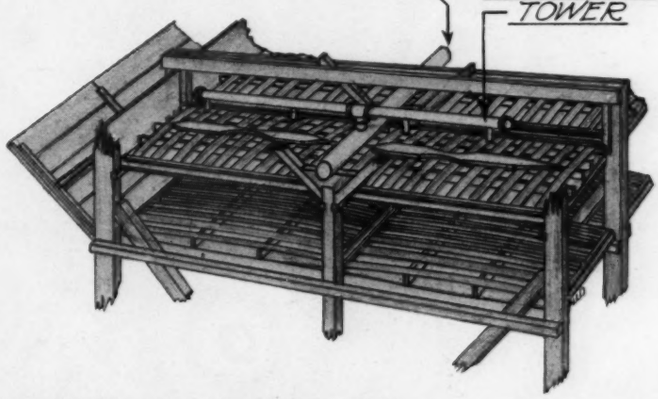
Factories in U. S. Oakland, Calif. and Belleville, N. J.
Canada - Peacock Bros., Ltd., Montreal, Toronto, Winnipeg, Vancouver. (Also Sydney, N.S.)
England - Audley Engineering Co., Ltd., Newport, Shropshire.
Buenos Aires, Argentine, - General Electric, Soc. Anon., Victoria 618 Esq. Peru.

Fluor Announces



SECTION OF FLUOR TOWER SHOWING PRIMARY DISTRIBUTING SYSTEM

A COOLING TOWER *with* PERMANENTLY *UNIFORM DISTRIBUTION* OF WATER

THE time-proved Fluor bowed type double-paneled deck has been combined with a splash system for a new cooling tower which will give continuously even distribution of water during its entire life; this means that none of the decking surface is wasted. There are no troughs to keep level —no adjustment is necessary.

There is also a new louver with an integral water retainer. This does not reduce cooling performance with low wind velocity, but still does reduce spray loss to minimum at all times.

The sturdiest, most reliable and economical tower built. Write for complete information.

Los Angeles
March 16-22
1931

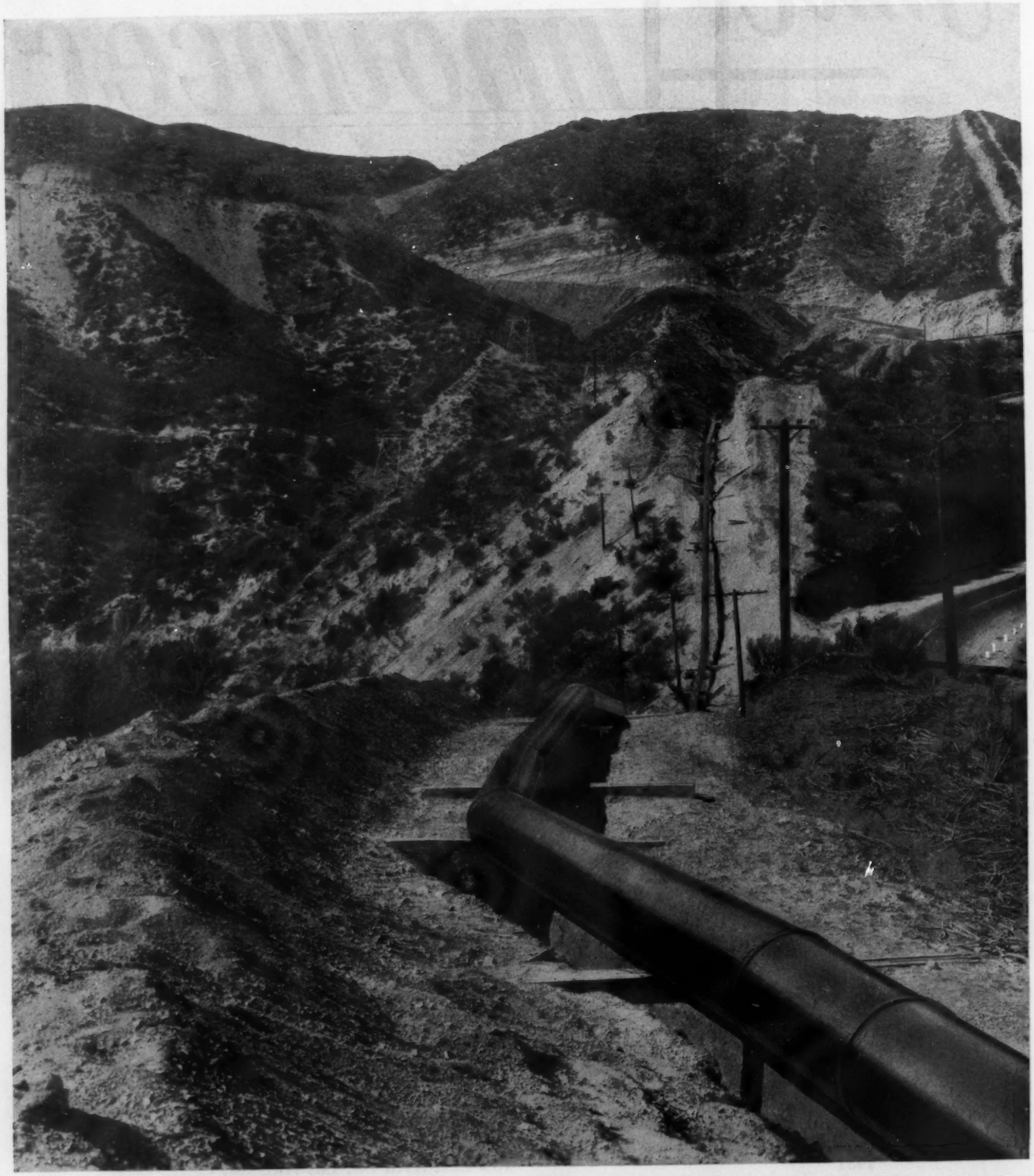
THE Fluor CORPORATION, LTD.

909 East 59th St., Los Angeles, Calif.

Tulsa, Okla. McBirney Bldg. | New York, N. Y. 30 Church St. | Dallas, Texas Magnolia Bldg. | 503 Fairfax Bldg. Kansas City, Mo.

March, 1931; Volume VII, Number 3, Western Gas is published by Western Business Papers, Inc., at 124 West Fourth Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

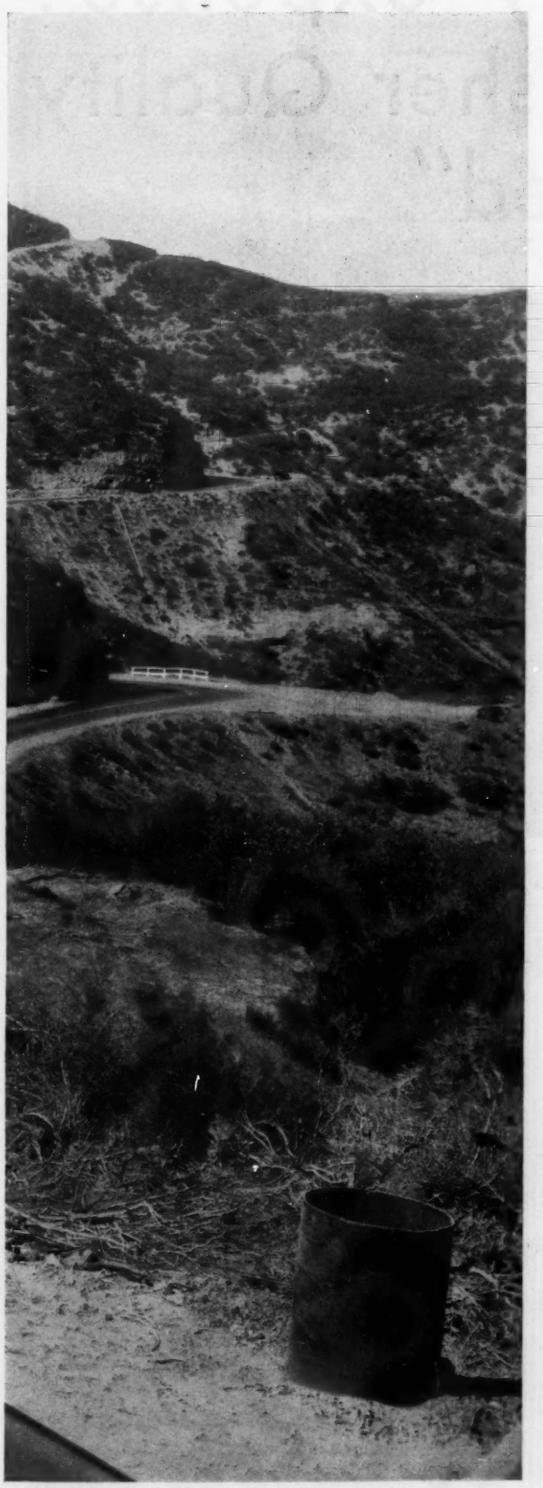
MOUNTAINS



SMITH *WELDED*

PIPE LINE AT THE

or What Have You?



The combination of SMITH Field Welding, SMITHWelded Pipe, Expansion Joints and Factory Bends takes them all in its stride . . . making pipe line at the lowest cost per mile.

• • • • •

A new book "the New Way of Designing and Building Gas Lines with SMITHWelded Pipe," provides for the benefit of the industry a scientific method, simple in application, to determine the factors effecting a minimum cost of pipe lines. A copy will be sent upon request to anyone interested.

A. O. SMITH CORPORATION

General Offices: Milwaukee, Wisconsin

OIL AND GAS FIELD PRODUCTS DIVISION

District Offices:

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GAS LINE PIPE

LOWEST COST PER MILE

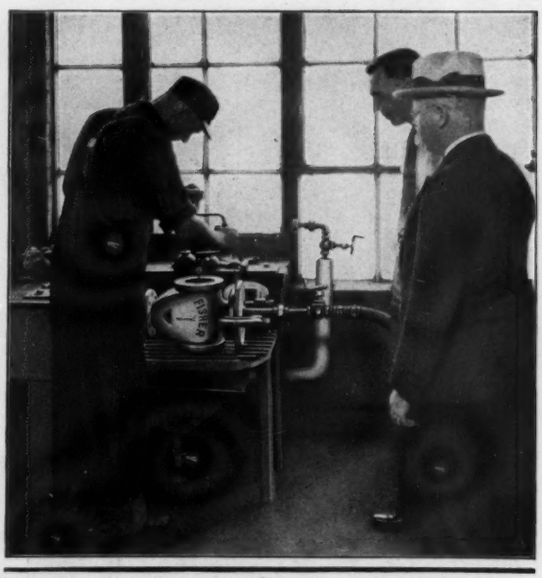
"An unnecessary expense? . . . Not when Fisher Quality must be maintained"

"IT IS an expensive operation but nevertheless a very necessary one. . . . if we are to continue to give you valves that we can guarantee to be tight under the operating conditions you specify.

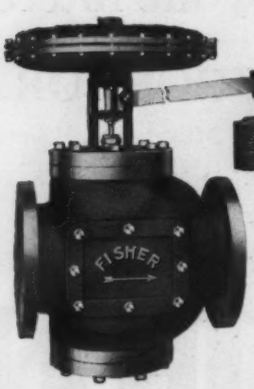
"If the double disc inner valve were ground in at room temperature instead of at operating temperature, the difference in expansion of body metal and disc metal would tend to unseat one of the discs when the specialty is in operation. As you see, each valve is carefully ground in by hand at the specified operating temperature.

"The testing is also done at the specified operating pressure and temperature. A valve that is tight at room temperature is not necessarily so when you get it in a hot line.

"There are many operations that others might regard as 'unnecessary expense' but that we know are good reasons why you have never had trouble with Fisher Specialties."



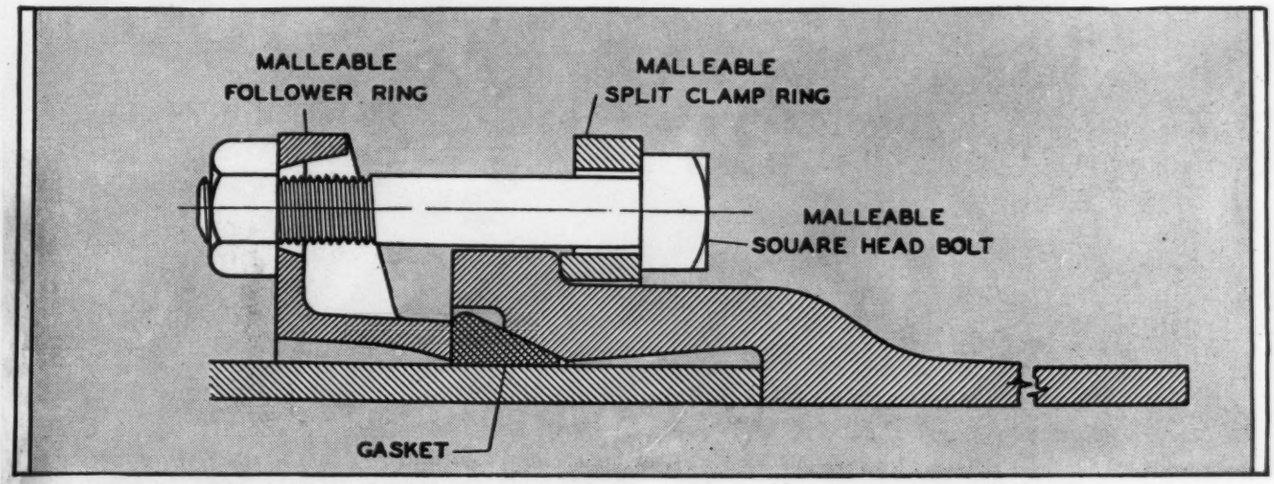
THE FISHER GOVERNOR COMPANY
2400 Fisher Building Marshalltown, Iowa



THE Type 210 Fisher Gas Pressure Regulator for low pressure gas distribution systems...and to control the gas pressure to burners under boilers, in ovens, etc. Gas pressure of a few ounces is maintained regardless of normal pressure pulsations on inlet side.

FISHER
the mark of scientific fluid control

Speed up your pipe laying . . .



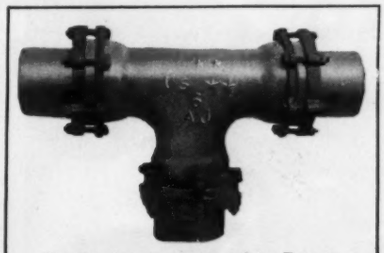
with this NEW gas-tight Anthony Joint

Now, with the new Anthony Joint, a contractor with a low priced, unskilled gang can complete a 100% gas-tight line well within his time contract. No tedious calking with the new Anthony Joint. No time taking pouring. No uncertainties. Just slip on the gasket, tighten up the bolts and your joint is finished — to stay.

The new improved Anthony Joint is the result of exhaustive experimentation in accordance with suggestions offered by engineers and gas company officials. It embodies the most favorable features of the sleeve type joint. Tests have shown that this new Anthony Joint will remain absolutely gas-tight under maximum pressure and maximum deflection.

The Improved Anthony Joint is offered in either deLavaud centrifugally cast pipe or in pit cast pipe and fittings. All rings, bolts and gaskets are interchangeable.

Of special interest is the fact that Anthony Joint tees, reducers and other fittings can also be used with plain end pipe. These Anthony Joint fittings enable the contractor to make sure of the tightness of the important terminal points of his line. Let us send you complete information regarding the many advantages which this new joint offers.



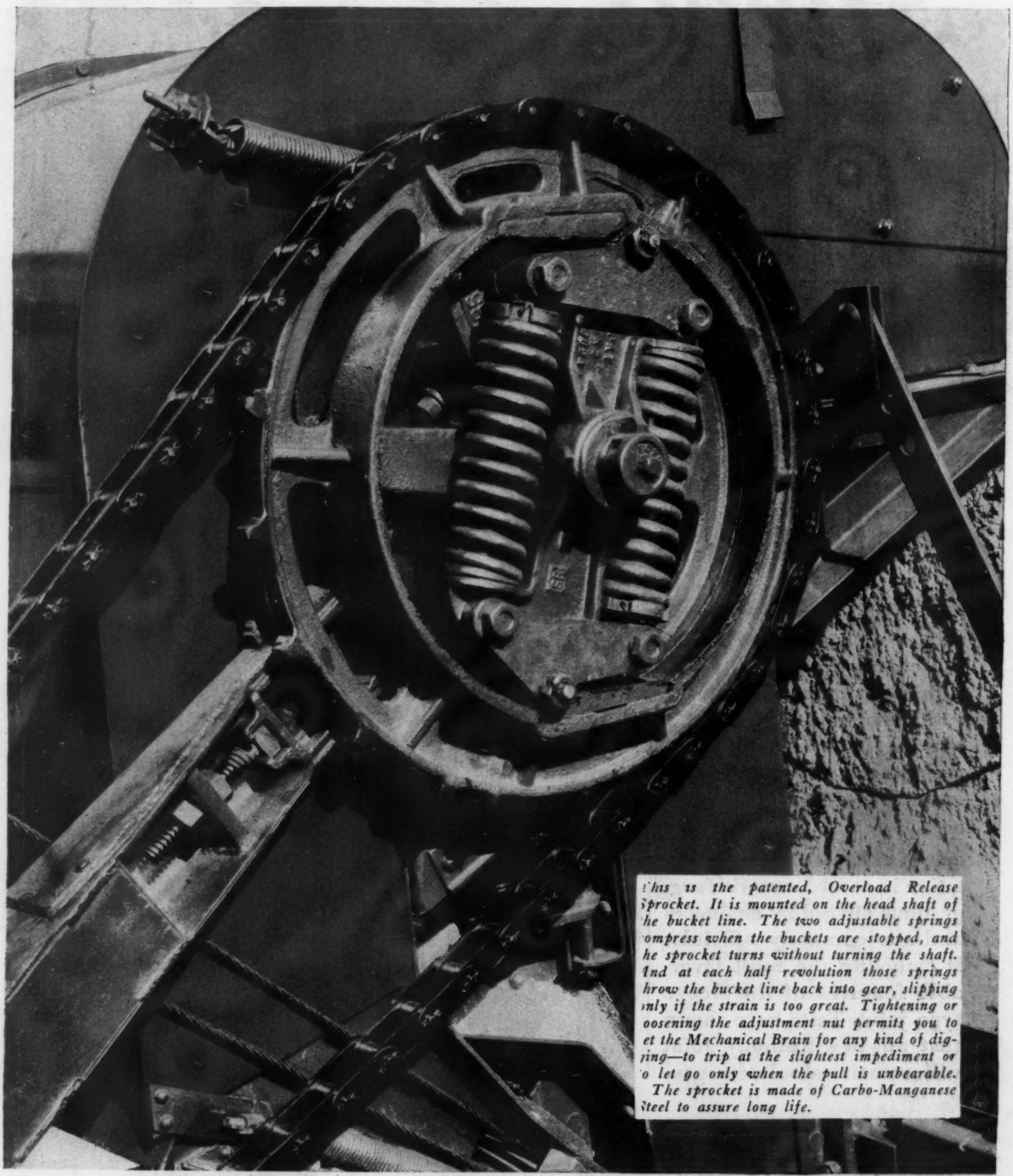
Showing how an Anthony Joint Tee can be securely attached to plain end pipe.

United States Pipe and Foundry Co., Burlington, N.J.

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles

SPECIALIZING IN INVENTING FASTER, CHEAPER MACHINES



This is the patented, Overload Release Sprocket. It is mounted on the head shaft of the bucket line. The two adjustable springs compress when the buckets are stopped, and the sprocket turns without turning the shaft. And at each half revolution those springs throw the bucket line back into gear, slipping only if the strain is too great. Tightening or loosening the adjustment nut permits you to set the Mechanical Brain for any kind of digging—to trip at the slightest impediment or to let go only when the pull is unbearable.

The sprocket is made of Carbo-Manganese Steel to assure long life.

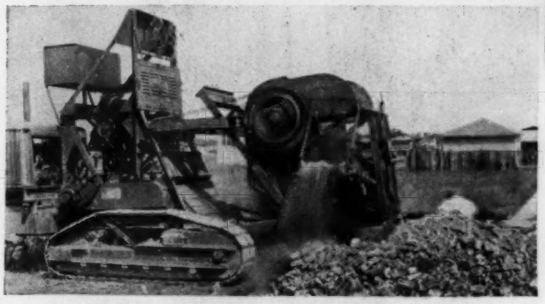
BARBER GR

STANDARDIZED MATERIAL HANDLING MACHINES

712 West Park Avenue

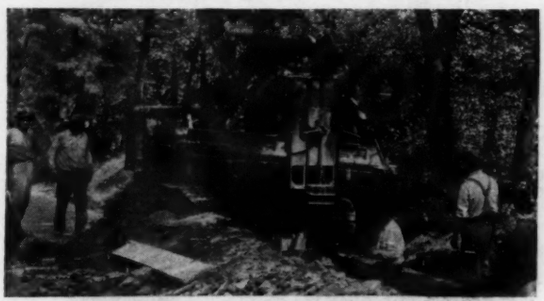
AND METHODS

The Mechanical Brain and Milling Action Digging cut through macadam pavement—we hear of jobs like this every day.



The Mechanical Brain is invaluable on digging like this. It lets go when the strain is too great, but keeps jerking at the rocks that are in the way.

The Mechanical Brain seems to know what to dig and not to dig. The Utility Special on town job that involves a lot of house service lines. Out of 50 encountered on a Kenosha job only one was broken.



Hidden behind a spoil bank of shale shaved off by milling action digging—the Mechanical Brain eases up the shocks of such digging as this.

The High-Speed DITCHER with the MECHANICAL BRAIN

Does Surprising Things

Barber-Greene Ditchers are almost human. The B-G Mechanical Brain — Overload Release Sprocket — stops the cutting teeth when they encounter any underground obstruction—but starts them again, automatically, if the operator decides to wade through.

Pipes and conduits are seldom broken. The Mechanical Brain stops the ditching in time to save them.

And in all kinds of going, the Mechanical Brain softens the shocks of digging, saving motor and machines from sudden, straining stops.

In hard digging, the Mechanical Brain seems to sense when to ease up and when to bear down, keeping the ditcher constantly milling at whatever is in the way.

And this patented Mechanical Brain is one big reason why Barber-Greenes walk through where others dare not and cannot go. It is one reason why you practically never see a Barber-Greene broken down. It is one reason why Barber-Greenes show higher daily averages on all kinds of digging. It is one reason why Barber-Greenes invariably show lower costs per foot.

Ask for a copy of *Ditching Snapshots and Records.*

Standardized Belt Conveyors — Portable Belt Conveyors
Portable and Self-propelled Flight Conveyors
Self-propelled, Self-feeding Bucket Loaders
Flight and Belt Car Unloaders — Snow Loaders
Vertical Boom Ditchers

EENE

Aurora, Illinois

NEW

AMERICAN PROVERS

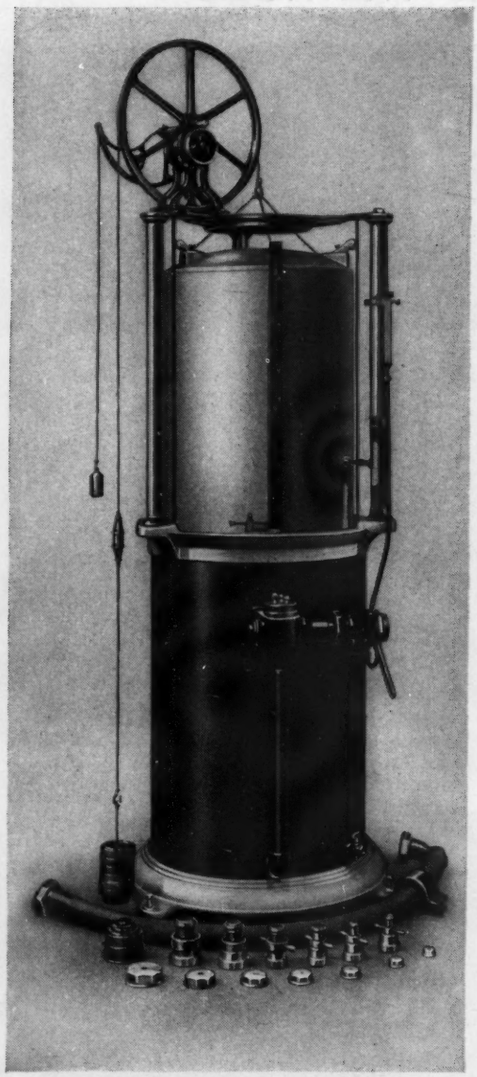
with OVER TWICE the former capacity

THE new American Provers — five foot, and ten foot — afford more than twice the capacity of the former type.

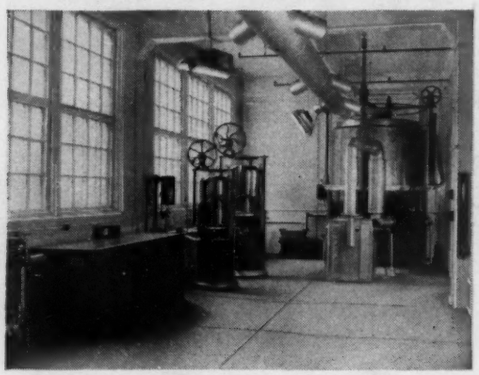
These improved models obviously enable larger meters to be proved at a rate equal to or in excess of rated capacities. Furthermore, advanced designing has greatly reduced the pressure loss at the meter inlet — an important improvement.

The new features include: (1) An increase in the airway diameter from the interior of the bell to the free end of the hose. (2) A larger dry well, hose and connection to conform to the increased area of the airway. (3) A handy gate valve. After a 2 years' exacting test in our own proving rooms this replaces the cock formerly used.

D. McDonald and Co. factory of American Meter Company, Headquarters for Apparatus, Albany, N. Y.



No.	Size	Capacity per hr. at 1½" pressure	
		FORMER TYPE	NEW TYPE
AL-13	5 ft.	950 cu. ft.	2250 cu. ft.
AL-14	10 ft.	1800 cu. ft.	5000 cu. ft.



Albany Research Laboratory of American Meter Company, specializing in low pressure measurement.

AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836
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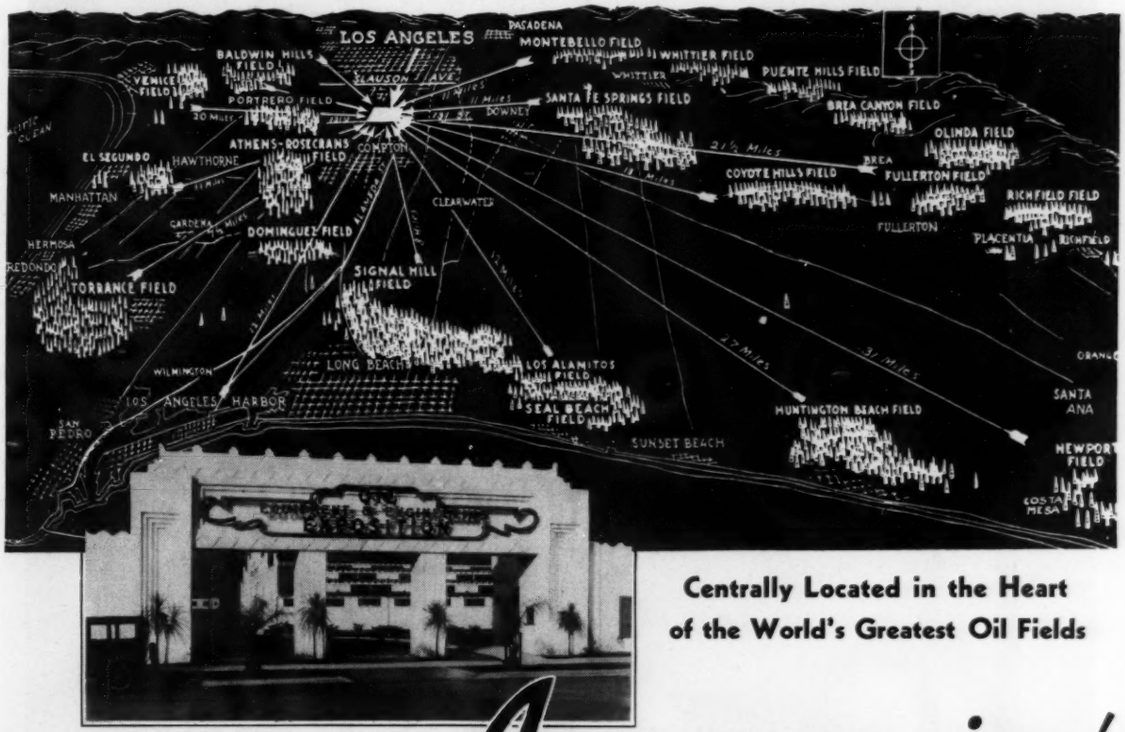
JOHN J. GRIFFIN & Co. Est. 1859 — HELME & McILHENNY Est. 1848 — D. McDONALD & Co. Est. 1855
METRIC METAL WORKS Est. 1888 — MARYLAND METER WORKS Est. 1866
NATH. TUFTS METER WORKS Est. 1860 — PACIFIC METER WORKS Est. 1901

SPACE 143 AND 196

MARCH 16 TO 22



Centrally Located in the Heart of the World's Greatest Oil Fields

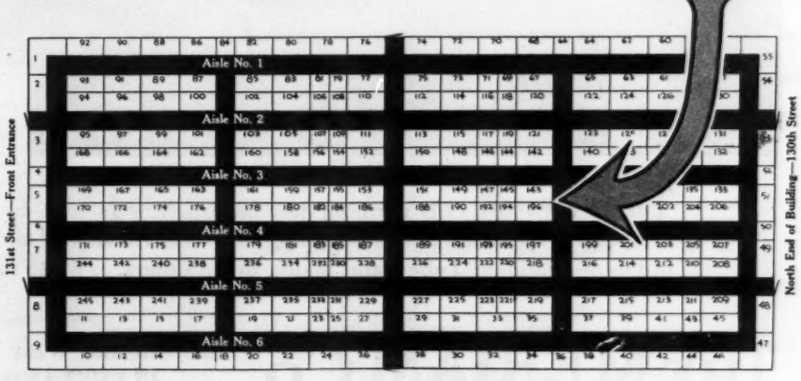
Announcing

...two Westcott & Greis display booths at the Oil Equipment and Engineering Exposition! Located in the center section of the new Exposition Building! Our exhibits will feature the newest developments and equipment pertaining to oil and gas measurement and control. Visit our space... make it your Headquarters throughout the Show!

Our Display Features the Following Lines:

Metric Metal Works of American Meter Co.
Taylor Instrument Companies
Davis Regulator Co.
Crosby Steam Gage & Valve Co.
The Meriam Co.
Reliance Mfg. Co.
Robinson Orifice Fittings Co.
"Oceco" and W & G Tank Equipment

FREE TICKETS Will be Sent to You on Request, Write... or Telephone to TUcker 3296



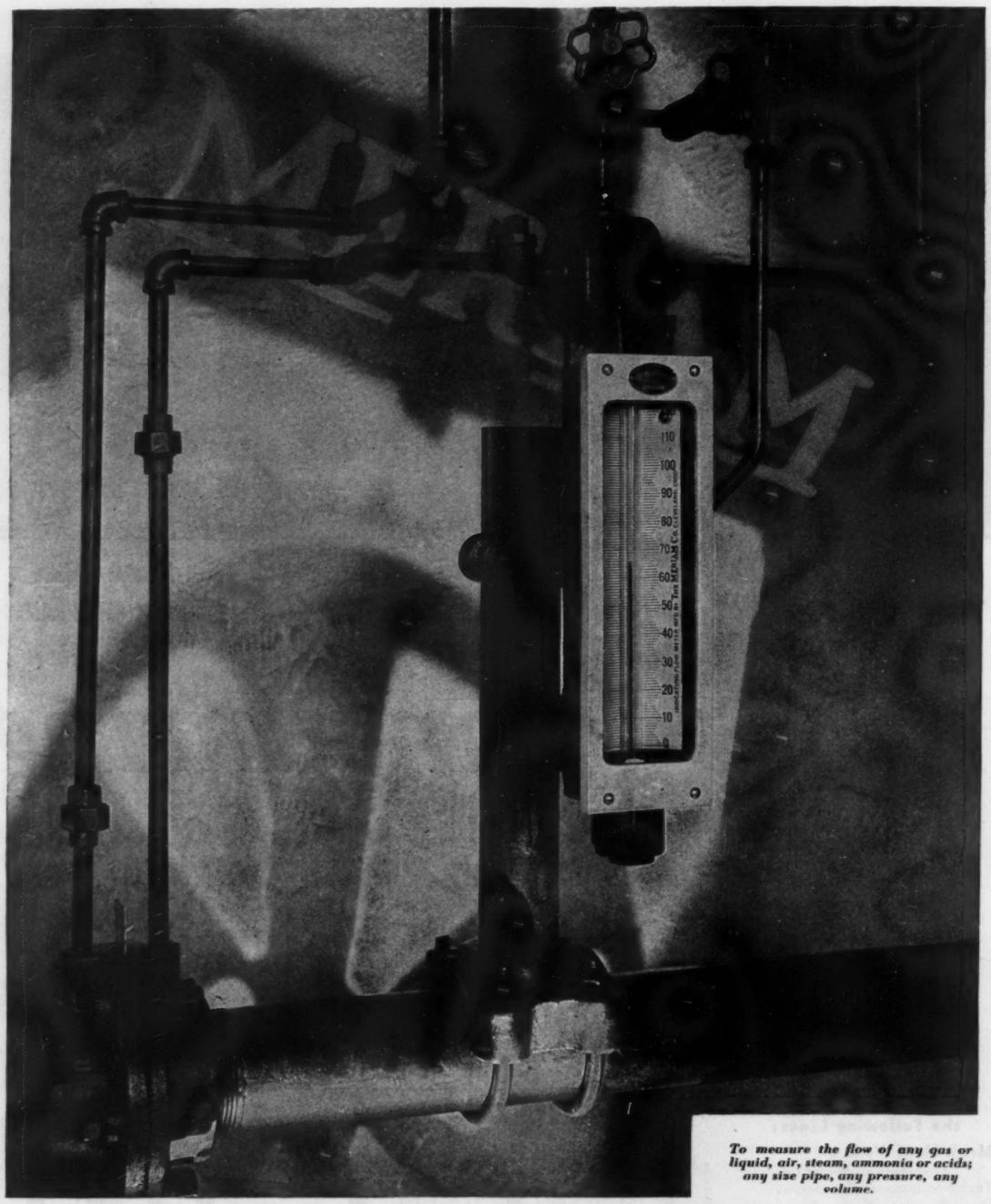
WESTCOTT & GREIS

MEASUREMENT AND CONTROL

LOS ANGELES TULSA HOUSTON DALLAS

SPACE 143 AND 196

MARCH 16 TO 22



To measure the flow of any gas or liquid, air, steam, ammonia or acids; any size pipe, any pressure, any volume.

THE FLOW METER used by Standard of New Jersey—Shell—Standard of Louisiana—Du Pont—Standard of Indiana—American Steel and Wire—Standard of Ohio—National Tube—and many, many others. Write for Bulletin No. 8.

THE MERIAM CO.

Madison and West 112th Streets
CLEVELAND, OHIO

We are in Chemical Engineering Catalog

WESTCOTT & GREIS

MEASUREMENT AND CONTROL

LOS ANGELES TULSA HOUSTON DALLAS

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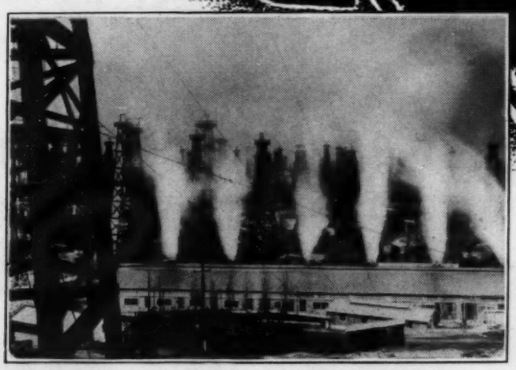


Four Westcott & Greis Branch Offices are strategically located for "on-the-spot" service to the Oil and Gas Industries

SERVICE from Field to Consumer

SALES AGENTS FOR:

Metric Metal Works of American Meter Co.
"Oceco" and W & G Tank Equipment
Crosby Steam Gauge and Valve Co.
Taylor Instrument Companies ★
Davis Regulator Co.
Reliance Mfg. Co. ★★
The Meriam Co.

SALES REPRESENTATIVES FOR:

Robinson Orifice Fittings Co.
Chaplin Fulton Mfg. Co.
Bristol Co.
Also a Complete Line of Laboratory Supplies.

California Field Only ★ ★★ Mid-Continent Field Only

Representing nine large factories...all of them leaders in the industry...the Westcott & Greis Organization has unlimited engineering and manufacturing facilities at its command. Your oil or gas measurement and control problems may be submitted to Westcott & Greis Engineers at all times... in no way placing you under obligation! The theoretical knowledge and practical experience of these men are constantly at your disposal, as a regular part of Westcott & Greis SERVICE.

Write or telephone... Anytime!

WESTCOTT & GREIS

MEASUREMENT AND CONTROL

LOS ANGELES TULSA HOUSTON DALLAS

THIS IS ORDINARY PIPE

You can see the difference *here*

THIS IS C. N. I. PIPE

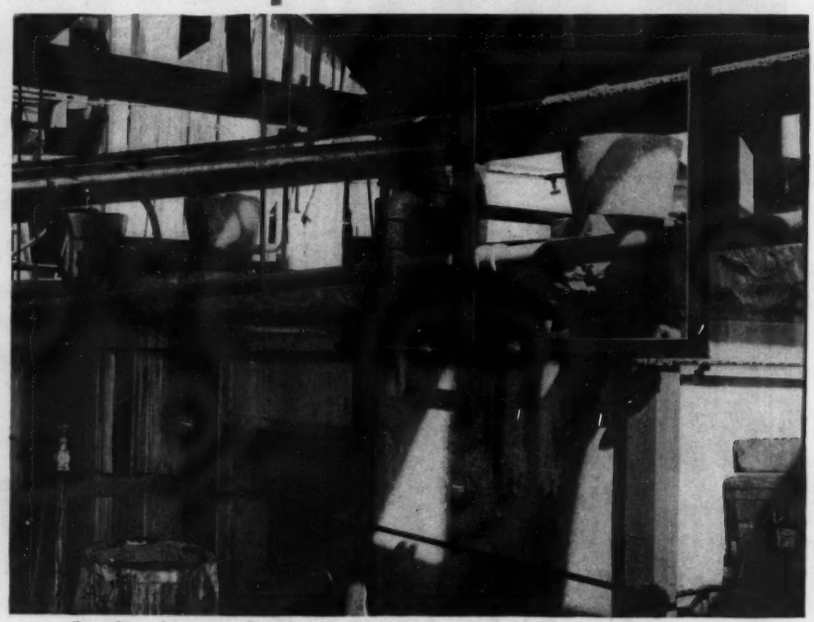
A Close-up View of Both Pipes

LOOK closely at the two pipes in the enlarged section of this illustration. The heavily corroded 1-inch line is ordinary pipe. The clean 3-inch line below it shows Walworth C. N. I. pipe and fittings. These lines have carried the same fluid for approximately the same number of months. The photograph is reproduced here without retouching, showing the pipes exactly as they are.

Where you have similar trouble with corrosion in pipe lines, try Walworth C.N.I. Pipe. The C.N.I. Pipe Manual, sent on request, will explain where it can be used to advantage.

Walworth C.N.I. Cast Pipe is available in sizes 1½ to 8″ inclusive.

C. N. I. Pipe Resists Corrosion



Two Pipe Lines on Bromine Stills at Dickinson Salt Works, Malden, W. Va.

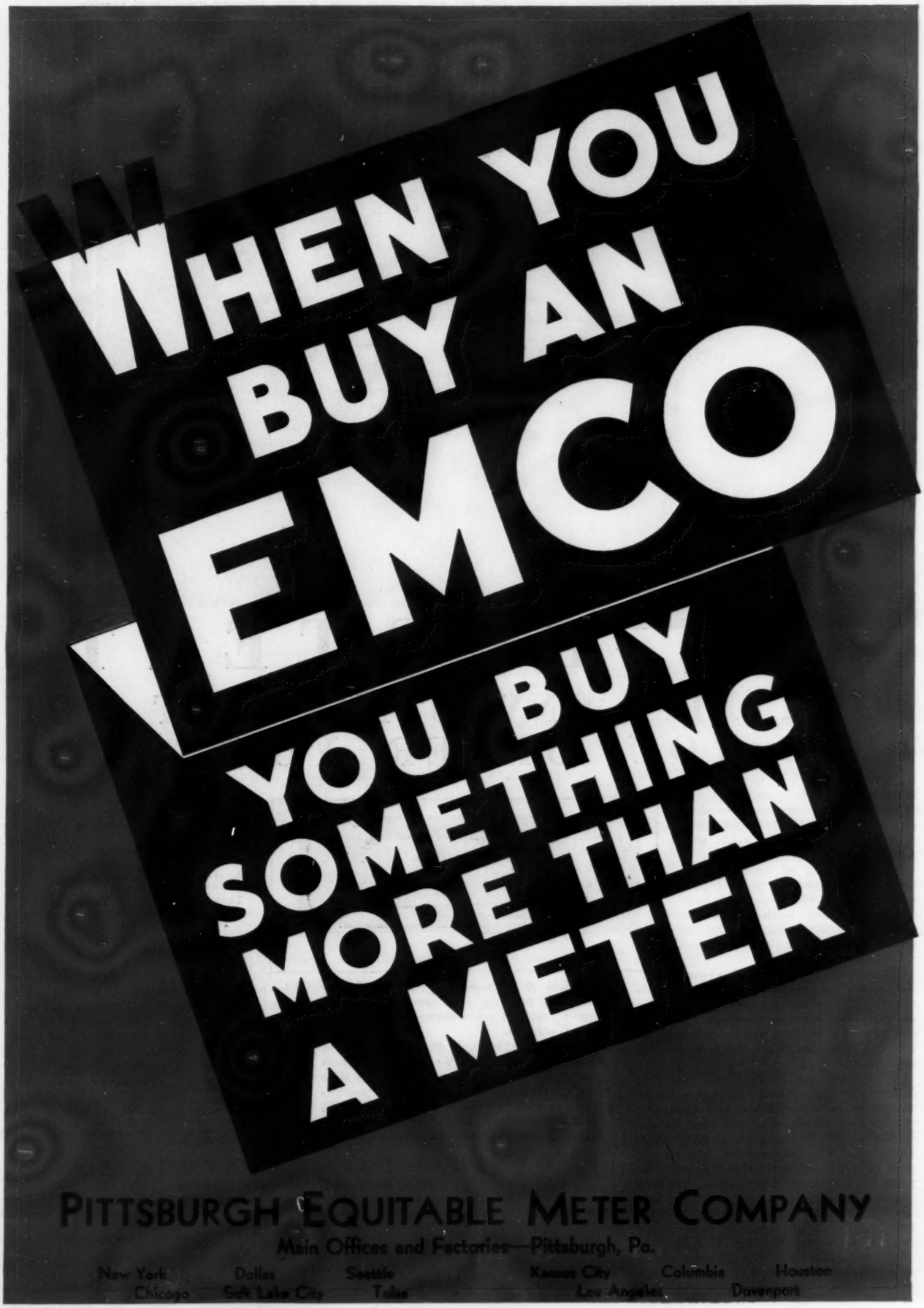
WALWORTH

. . . Distributors in Principal Cities of the World . . .

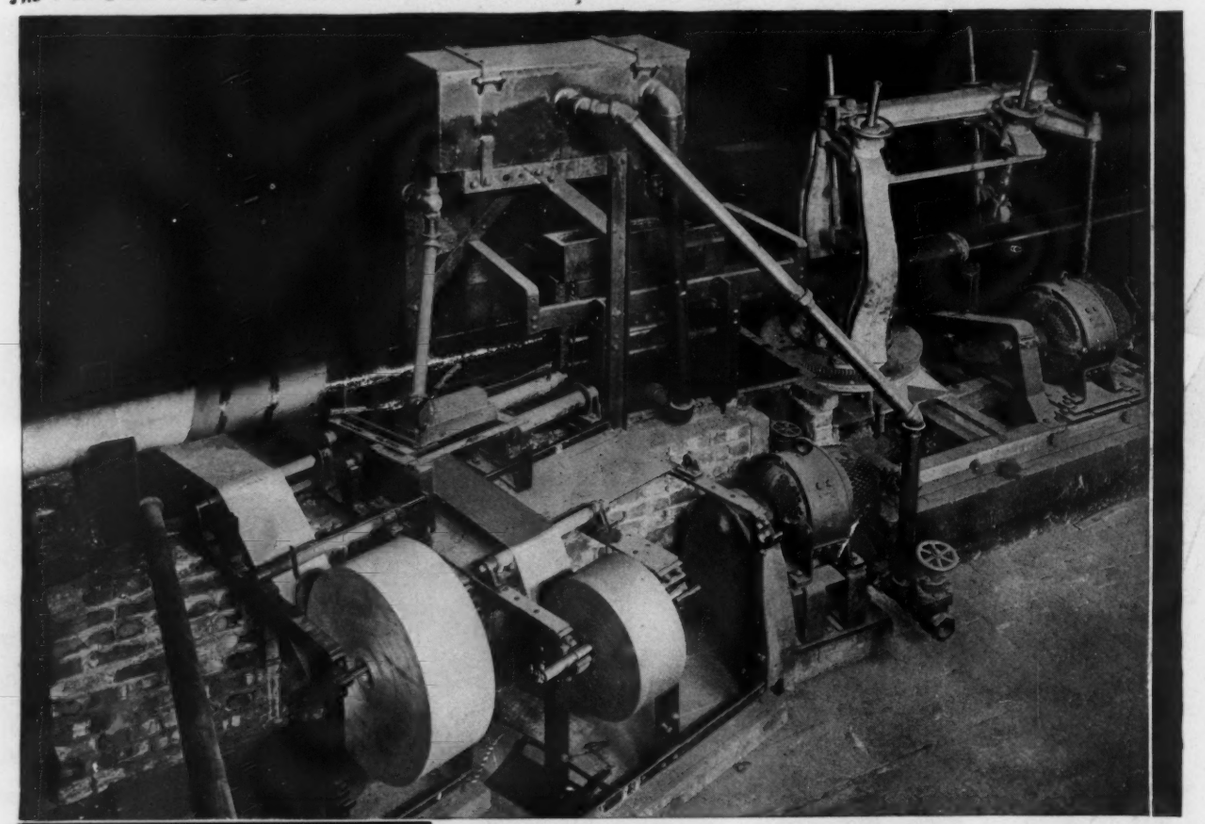
General Sales Offices: 60 E. 42nd St., New York

WALWORTH CALIFORNIA CO., 235 Second St., San Francisco

WALWORTH COMPANY, 809 Fourth Place, Los Angeles


WHEN YOU BUY AN EMCO
YOU BUY SOMETHING MORE THAN A METER
PITTSBURGH EQUITABLE METER COMPANY
Main Offices and Factories—Pittsburgh, Pa.
New York Dallas Seattle Kansas City Columbia Houston
Chicago Salt Lake City Tulsa Los Angeles Davenport

The Coating and Wrapping is a continuous mechanical process. Felt and kraft applied under tension assuring precision of spacing.



PROTECT

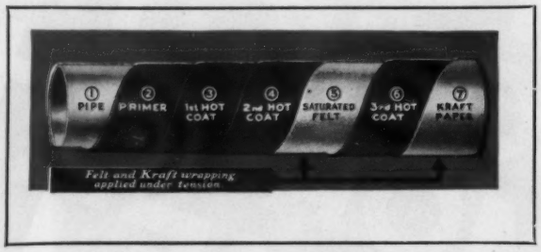
YOUR PIPE INVESTMENT AT THE TIME YOU ORDER YOUR PIPE

Line pipe is steel, and as such, is subject to corrosion—unless protected with a coating that is resistant to moisture, acids and alkalis.

Hand-coating of new pipe in the field offers but partial protection, and very expensive protection, to say nothing of the excessive cost of digging up old pipe lines, reconditioning and relaying them.

Stockholders in pipe line companies are looking for substantial dividends. They have every right to be disquieted if reports show great chunks gouged out of the profit columns to pay for frequent reconditioning of the pipe lines.

The time to protect the pipe is *before* the pipe is laid. Pipe purchased at the mills listed later, mechanically coated and wrapped *at the mill* by the Hill, Hubbell & Company Process, does away with all uncertainty, lowers the cost of pipe protection and brings the pipe to the field thoroughly armored against corrosion, ready for weld and backfill. The outer wrappings, applied under high tension, protect the enamel coating during transit and after the pipe is in the ground act as a mechanical protection against soil-stress. Pipe protected by the Hill, Hubbell & Company Process of mechanical coating and wrapping gives many years of uninterrupted and leak-proof service.



The Hill, Hubbell & Company Machine Coating and Wrapping Process was developed by the same group that has specialized for 23 years in protective coatings. Their plants are located in the following cities, for the production of the pipe manufacturers listed.

Central Tube Company
Ambridge, Pa.

Spang-Chalfant & Company
Ambridge, Pa.

National Tube Company
Lorain, Ohio

A. O. Smith Corporation
Milwaukee, Wis.

Youngstown Sheet & Tube Co.
Indiana Harbor, Ind., and
Youngstown, Ohio.

Jones & Laughlin Steel Corp.
Aliquippa, Pa.

Pipe up to 24-inch diameter is coated and wrapped by the Hill, Hubbell & Company Process and conform to any specifications as to the number of machine-applied hot coatings and wrappings required.

BITURINE COATINGS

Biturine Enamel — Biturine Solution No. 5
Biturine Enamel Primer — Biturin 70-30
Biturine Coupling Mixture

Biturine Enamel and Primer are perfectly adapted to the Hill, Hubbell & Company Process of mechanically applying coating to the pipe at the mill.

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Export Department

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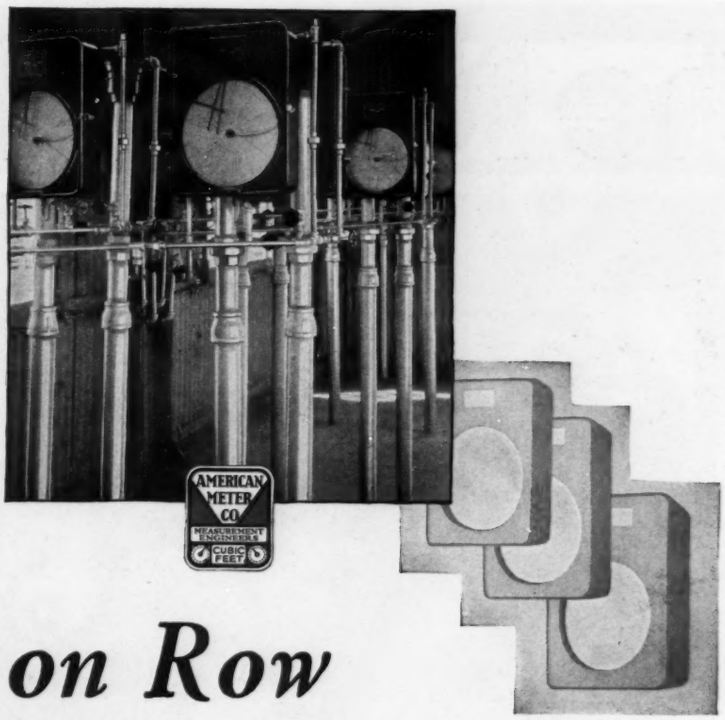

Interior view showing one of two Westcott Orifice Meter settings in a Louisiana station of the Southern Natural Gas Company.

Row on Row of Reliable Records

Less than twenty years ago no Gas Company's financial executive or customer would have accepted the records of an Orifice Meter. Then it was merely an interesting laboratory apparatus.

Today millions of cubic feet of gas are bought and paid for on the authority of tens of thousands of Westcott Orifice Meters. The absolute reliability of the Westcott Orifice Meter is universally recognized and this instrument is writing a new chapter in the annals of the Gas Industry.

New and practical methods for utilizing the orifice for measurement are constantly being investigated and tested in our Erie laboratory.

Complete information is always available on Westcott Orifice Meters, Rate Volume Controllers, Indicating Flow Meters, Liquid Level Recorders and Metric Ironcase Meters.

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The World's Largest Manufacturers of Gas Meters and Allied Apparatus

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The New TYPE-40

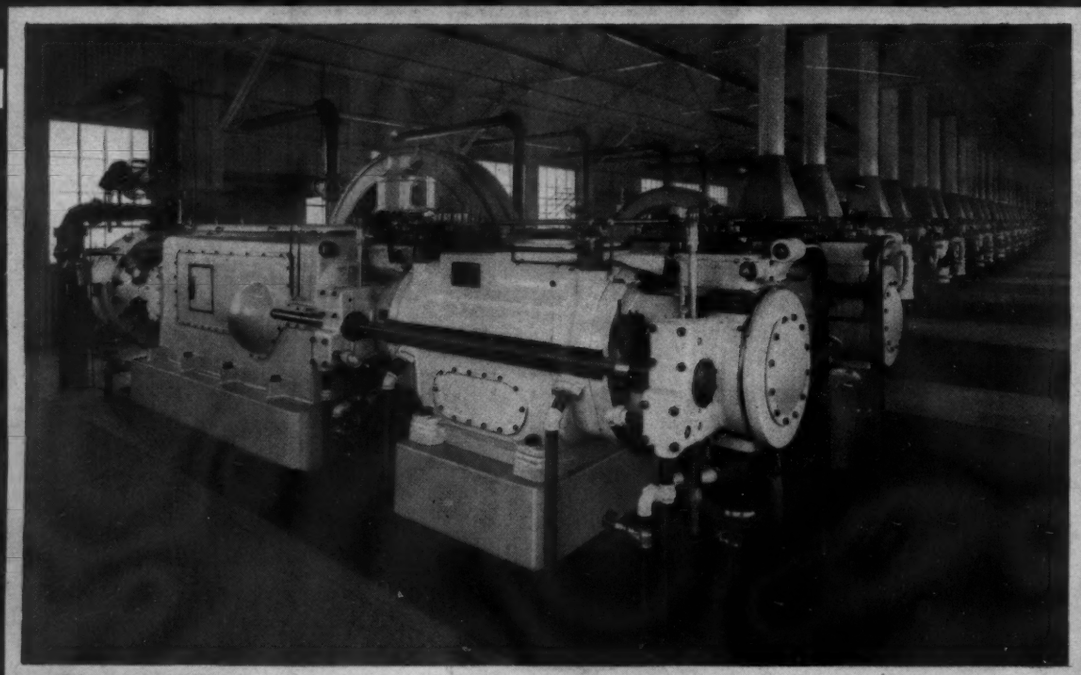

Photo shows one new Type-40 twin compressor unit in Sinclair Plant No. 17.

COMPACT

About twice as much horsepower goes in given space.

LOW COSTS

Low, with moving parts easy to reach for speedy adjustment.

ACCESSIBLE

Costs of housing, foundation and piping are low for horsepower.

LASTING

Timken main roller bearings and special materials for trouble-freedom.

ADEQUATE

Ample flexibility and low upkeep.
Single 200, Twin 400 B. H. P.

New and different . . . but thoroughly tried and soundly proved by months and months of service in the field. Already, Type-40 has been chosen by several of the country's largest oil and gas companies. Ask for new Bulletin.

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MOUNT VERNON, OHIO ··· GROVE CITY, PA.

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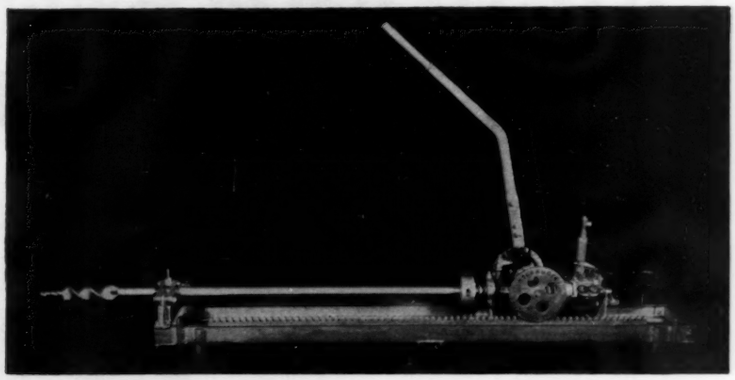
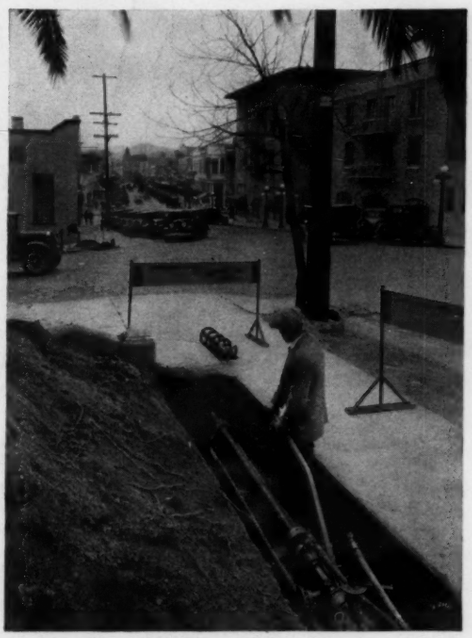


This remarkable new earth-boring tool, bringing great economies, marks a revolutionary advance in engineering and construction.

HYDRAUGER



Hydrauger at work—bore made at Petaluma, California. Even through a hard soil formation, and counting time involved in adding boring-bar extensions, Hydrauger completed this 40-foot bore in 50 minutes, for laying 6-inch pipe. This is typical of the time-saving advantages of Hydrauger.

BORING HORIZONTALLY at speeds up to four feet per minute, **Hydrauger,** the new hydraulic auger, makes possible **vast savings in time** in public utilities construction work.

With ease and at astoundingly low costs, Hydrauger bores for the placing of telephone and telegraph cables, electric conduits, water and gas lines, sewers and storm drains. It avoids delays incident to cutting paving, digging trenches, tunneling and backfilling—all formerly considered necessary. Hydrauger renders obsolete the tedious hand-methods of driving, jetting and jacking pipes under pavements, railroads, parkways and flowerbeds.

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Send for illustrated leaflet and operating cost analysis, showing savings made possible by Hydrauger, in comparison with other methods.

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In providing the needed dependability... in assuring more enduring pipe life...in creating savings which aid in lowering your total pipe line costs, Naylor *Spiralweld* Pipe is demonstrating it is the outstanding pipe for oil field service.

The many miles of Naylor Spiralweld Pipe conveying air - water - oil and gas are indicative of the increasing preference for Naylor Spiralweld Pipe. Write for more information.

A 12" Naylor *Spiralweld* Pipe gas gathering line, 40-foot lengths—laid in Oklahoma.

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in Old Philadelphia–

cast iron gas mains
laid in 1835
are still in active service

WHEN the State House flag-pole was at a "dizzy height"... when hansom cabs were the latest thing in urban transportation, and "burning the midnight oil" was frequently a fact . . . Philadelphia in 1835 put down its first gas mains—9000 ft. of cast iron pipe.

And today, some 1000 ft. of those self-same mains are still in active service. In a recent letter from the Philadelphia Gas Works Company we read as follows: "That part of the original line which is no longer in service was removed at various times between 1904 and 1930 because of changes in street lines, construction of subways and other operations, *none of which involve the strength or quality of the pipe proper.*"

With original cast iron gas mains as a constant reminder of long and economical service, it is not to be wondered that Philadelphia chooses cast iron gas mains today.

Today, laboratory control and scientific machinery bring about a high uniformity of quality not thought possible a century ago. Present-day knowledge of metallurgy and improved methods of casting have resulted in a greatly improved product.

Engineers, contractors and city officials desiring information on the use of cast iron pipe for gas, water, sewers, road culverts or for industrial needs, are invited to write to Thomas F. Wolfe, Research Engineer, The Cast Iron Pipe Research Association, 309 Peoples Gas Building, Chicago, Illinois.

Efficient mechanical joints for cast iron gas mains are now in use and obtainable for high-pressure gas distribution.

CAST IRON PIPE

Cast iron pipe bearing the "Q-check" trademark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Company, 11 Broadway, New York.

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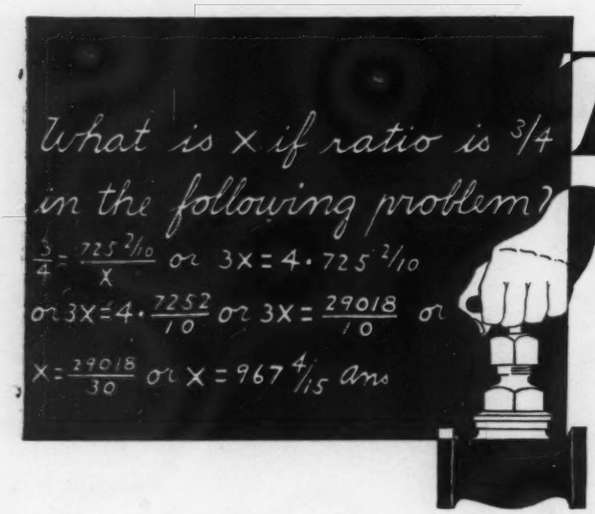
CAST Q IRON

The "Q-check" symbol shown above has been adopted as the trademark of The Cast Iron Pipe Research Association.


What is X if ratio is 3/4
in the following problem?
3/4 = 725 2/10 / X or 3X = 4 · 725 2/10
or 3X = 4 · 7252/10 or 3X = 29018/10 or
X = 29018/30 or X = 967 4/15 ans

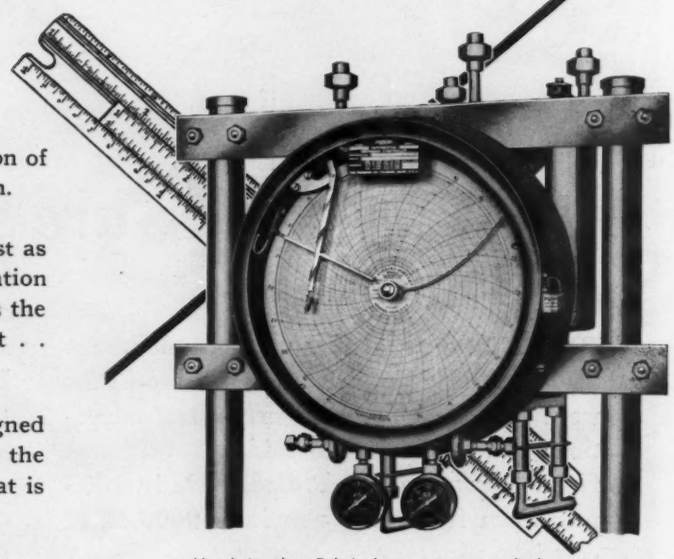
THEN— —THE HAND NOW—

The Slide Rule ended Long-Hand Computation of ratios. It saved time . . it speeded production.

The Foxboro Ratio Flow Controller ends, just as definitely, all necessity of Hand-Valve Regulation in controlling the flow ratios of fluids. It does the job . . better . . quicker . . with less effort . . more accurately.

The Foxboro Ratio Control is especially designed for the various applications encountered in the Oil Industry. It is built with an accuracy that is not disturbed even in the hardest service.

Investigate this dependable Foxboro Instrument today —it will pay you. Write to Dept. G.



Used in the Oil Industry to control the ratio of Lean Oil to Rich Gas in an Absorption Plant. Also, for controlling the ratio of Steam to Fat Oil in the Steam Still.

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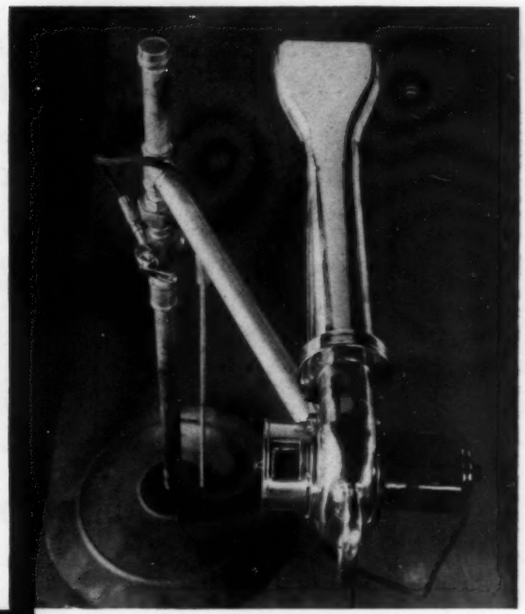
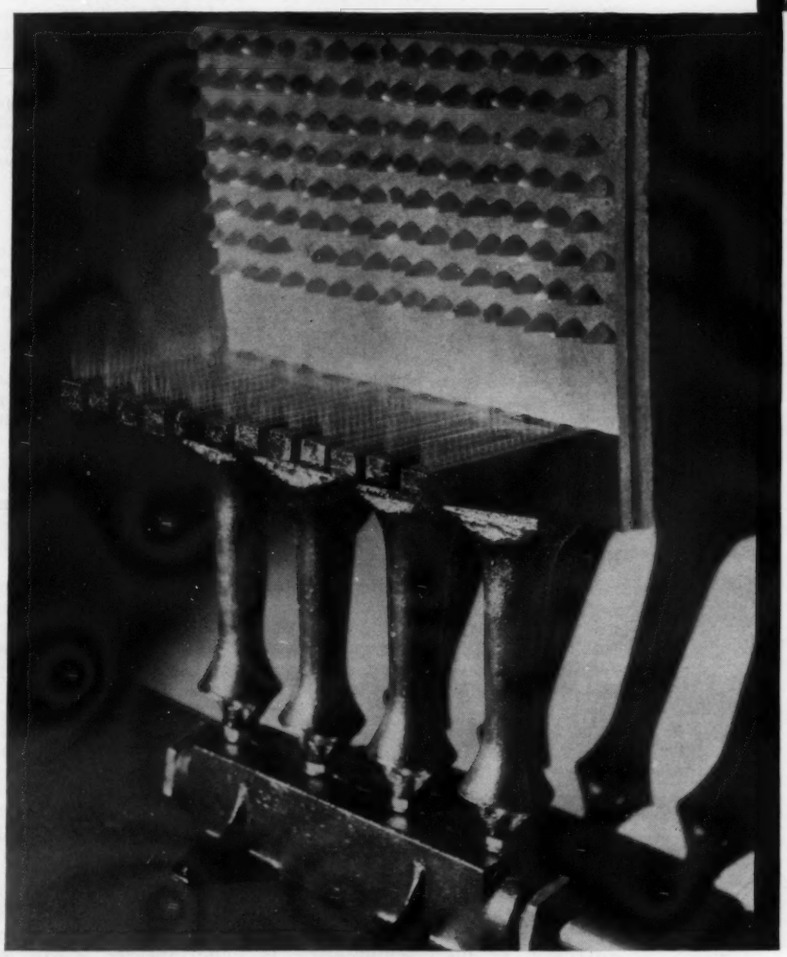
New N. G. E. Gas Burners . . .





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for Dutch type bake ovens . . .

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. . . both designed to meet the requirements of each application better than they have been met before . . . backed by the same research and engineering experience that have made N. G. E. Gas Burners Type "A" the most widely-used in the San Francisco area...Send for Data Sheets 21b-21c...

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ANUBIS DIFFERENTIAL PRESSURE RECORDERS

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Worthington builds complete lines of pumps for handling fluids at all practicable ranges of temperature and pressure; air, liquids and semi-liquids, clear, gritty, acid, alkaline or neutral in character.

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Steam Pumps—Direct-acting and flywheel reciprocating pumps—horizontal and vertical; simplex and duplex; piston and plunger; simple, compound and triple expansion; condensing and none-condensing, in all sizes and types to meet every service requirement.

Centrifugal Pumps—Horizontal and vertical; single and multiple stage; types for ordinary contractors' needs and high efficiency pumps for the most exacting service. Built in special metals for special purposes, for belt, motor or engine drive. Worthington specializes in centrifugal pumps and offers machines capable of meeting the most unusual requirements through wide ranges of conditions. Low pressure large volume service for capacities as great as 250,000 gal. per minute and multi-stage pressure pumps capable of working against pressures as high as 1600 lb. per sq.-in.

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Reciprocating types; single and double-acting single plunger and single-acting two and three plunger pumps.

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Horizontal four-cycle double-acting type; for natural or blast furnace gas; for power and for gas compressor service in sizes ranging from 160 hp. to 5000 hp.

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Vertical types for direct power or generator service—stationary and marine service.

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Ranges of power through various types from 50 hp. to 12,000 hp.

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Horizontal and vertical; single and duplex; one, two, three and four stage; steam, Diesel engine, belt or direct-connected-motor drive; for air, gas, or ammonia service; used with Worthington-Harris air lift and for gas lift. Built in sizes and capacities to meet the entire range of industrial requirements.

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The Worthington-Gilman products comprise rock hammers for hand drilling rock, shaft sinking, etc.; auger drills for coal mining; drifters for tunnel and mine opening and development work; forging furnaces and automatic heat treating machines for drill steel; drill steel, hose and other accessories. A wide range of sizes to meet every drilling need.

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A combined Worthington and Goodyear development. Specially rubberized V-shape cord belts running in grooved pulleys with a wedging contact, making possible short center drives with practically 100% efficiency. Transmission clean, quiet and without slip. Applicable in all cases where the grooved type of belting transmission can be used.

CHROMIUM PLATING

For machinery parts, such as rolls, platens, piston rods, driving shafts, valves, etc., where resistance to wear, abrasion, corrosion or high temperature is important, or where low coefficient of friction is desired, Worthington is fully equipped for the highly skilled treatment necessary for this class of plating, and invites correspondence on requirements.

INQUIRIES

Worthington invites inquiries on any of the above products, and will promptly forward literature covering the subject in detail. Address the nearest district office or representative.

G-61

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124 West Fourth Street
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Gas meters, too, must have absolutely tight connections. Dresser Couplings dominate for this service —just as they dominate for high pressure pipe lines. Easy to install, Dressers *remain permanently tight* under all working conditions. First cost is the only cost.

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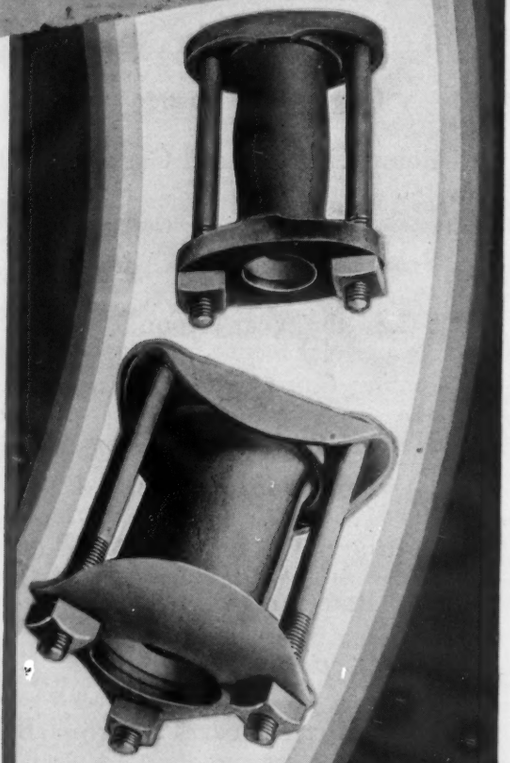

DRESSER COUPLINGS DOMINATE

for this service

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A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

SAN FRANCISCO LOS ANGELES DALLAS

Review of the Month

MANY projects conceived late in 1930, or early in the new year, advanced to the "under construction" stage during the past month. New business departments, now that January recapitulations are out of the way, also stepped into the new year's stride. The "business as usual" sign is posted at all points in the gas industry—with more than one indication that business will be even better than usual.

New in Gas Line Construction

Especially does the above apply to transmission enterprises.

Ground was broken about the middle of the month on the Western Gas Co.'s Arizona carrier, which has been in the offing for a year or more. Completion is due this summer.

Contracts were expected to be let late in February on the North Central Gas Co.'s 378-mile system in Wyoming and Nebraska, calling for completion by September of this year.

On April 1 Southern Fuel Co. will negotiate contracts for the Kettleman Hills-Long Beach 26-inch line, newest major construction on the west coast. Preliminary work is well advanced on this project, some pipe having already been laid to be linked into the main system later.

United Gas Public Service Co. has its 158-mile pipe line from Kirbyville, Texas, to Franklin, La., building, and several extensions to the United system are announced this month.

The Colorado Natural Gas Co. enterprise, to bring gas from Hugoton, Kan., fields to Colorado Springs, Colo., will get definitely under way in early spring, to be finished by fall, according to word from the company. Two hundred miles of 10-inch line is involved, with a number of laterals also included.

The Des Moines-Mason City, Ia., 20-inch extension to Northern Natural Gas Co.'s line from Texas will be finished by April 1. Including the main 24-inch line and laterals, some 917 miles of the system have been laid in the past nine months, and 30 towns are already receiving service.

A 120-mile project, of 12-inch and 8-inch line, is made known by Texas Public Service Co., Austin, Texas, for immediate construction—northeast from Big Lake fields of Texas to San Angelo; southwest from the same fields to Girvin, both in Texas.

Change-Over Is the News in Mid-West

Wherever gas men of the Middle West congregate, the leading topic is natural gas change-over. At the Mid-West Regional Sales Conference, Chicago, in February, this subject got the spotlight. Change-over, large-volume load building, and kindred subjects, likewise feature the coming April sessions of the Mid-West Gas Association, scheduled for Dubuque, Ia., April 13-15.

Keeping Abreast of Butane-Propane Growth

Liquefied petroleum gases — an important off-shoot of the natural gas and petroleum industries—have grown to a stature entitling them to marked consideration. They give every promise of doubling their field in 1931. *Western Gas* over the past two years has included this industry in its editorial coverage, with monthly feature articles and news on its technical progress and rapid expansion. Beginning with this issue these developments are given increased attention. Readers may turn to the "Butane-Propane News" section and find the facts of current interest in reference to liquefied petroleum gas service.

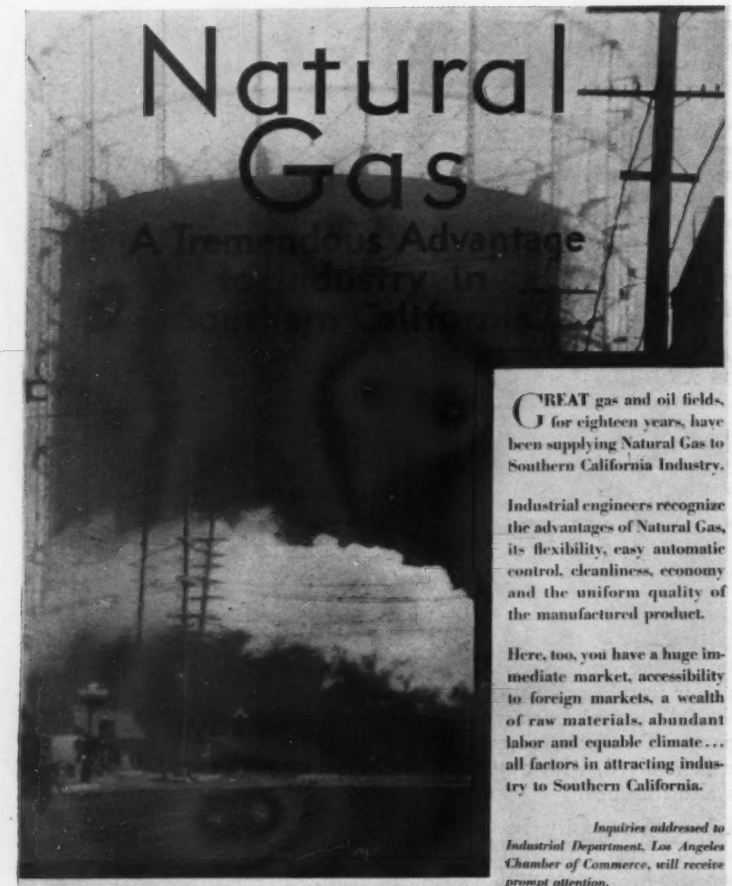
Conservation Progress In California

Improvement in the California natural gas conservation situation is heralded in a Railroad Commission statement, referring particularly to Kettleman Hills production. This leading field, the statement runs, is accountable for some 426 million cubic feet daily; of this over 201 million is being taken by gas utilities; 70 million goes for field and miscellaneous use, and 155 million is blown to the air. Two pipe line projects originating in the Kettleman field will call for 143 million cubic feet daily when complete.

For the state as a whole, 1930 saw a total of slightly less than 545 billion feet produced—141 billion going to utilities, 182 billion for field and miscellaneous use, 221 billion wasted. During the year, total monthly wastage was reduced from nearly 27 billion feet in February, 1930, to about 7 billion in January, 1931—a 74 per cent decline; further reductions will soon be recorded.

A 3-Company Advertising

TWO years ago commercial departments of the three gas companies headquartering in Los Angeles organized the Natural Gas Bureau, operating a central exhibit of equipment and assisting by other means in industrial and commercial sales promotion. Now another far-reaching move is announced for the cooperative pursuit of sales in the same territory. Advertising departments of the three companies are administering a joint budget this year—not supplanting individual company advertising, but supplementing it in several important respects. Walter D. Thurber, as secretary of the joint committee in charge of this program, reports on the joint advertising effort for *Western Gas* readers. The author is advertising manager of the Southern Counties Gas Co. and chairman of the Pacific Coast Gas Association Publicity and Advertising Section.—*Editor.*



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Inquiries addressed to Industrial Department, Los Angeles Chamber of Commerce, will receive prompt attention.

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AT RIGHT.....domestic appeal, through newspaper advertising.
BELOW.....industrial-commercial copy in So. Calif. magazines.

LET NATURAL GAS DO IT!
Pleasing the Guest
is often a MATTER of
HOT WATER
EVERY hour in the twenty-four, hot water builds good will. Hardly any other single feature of the modern hotel is so important.
Natural gas for heating water invites a frank comparison of its convenience, controllability, and cleanliness. No labor, handling, or storage is involved in using natural gas for water heating.
Consult the engineers of your gas company. They will be glad to explain the part natural gas plays in reducing overhead expenses. Increase your satisfied clientele by supplying abundant hot water.
SOUTHERN CALIFORNIA GAS COMPANY
LOS ANGELES GAS and ELECTRIC CORPORATION
SOUTHERN COUNTIES GAS COMPANY

[Women Prefer the New Automatic Natural Gas Water Heaters]
When with a Rush
....the FAMILY
STARTS the DAY
ABUNDANT hot water counts! The new automatic natural gas water heaters give it the day through, the day 'round, the house over. Your only effort is to turn the tap.
Hot water, the modern way, yields a twenty-four hour dividend in health, convenience, and economy. Off duty, a dependable "pilot" keeps your water coasting along near top heat. Your decision now to install a new automatic natural gas water heater marks the beginning of a new day in your household.
Look for the Blue Star Seal of the American Gas Association when you consult your plumber, hardware dealer, or gas company.
SOUTHERN COUNTIES GAS COMPANY
SOUTHERN CALIFORNIA GAS COMPANY
LOS ANGELES GAS and ELECTRIC CORPORATION
LET NATURAL GAS DO IT!

Joint Program

By WALTER D. THURBER

Advertising Manager
Southern Counties Gas Company

OUTDOOR ADVERTISING on gas water heating was posted on February 20, to run for 30 days; lower poster is scheduled for April 10 to May 10—263 boards are being used in the joint advertising campaign for Los Angeles territory.

THE three gas utility corporations operating in what is known as the Los Angeles territory, serving a total of 782,817 natural gas consumers, have chalked off another milestone in the forward march of modern natural gas service in the field of present day competition.

These three great companies—the Los Angeles Gas and Electric Corp., the Southern California Gas Co. and Southern Counties Gas Co.—have contributed much in the way of practical experimentation in several phases of the gas utility business. One of the noteworthy developments for the current year is a joint campaign of consumer education through joint advertising, which was inaugurated in February. We use the word "joint" here to differentiate this southern California natural gas advertising from Pacific Coast-wide "cooperative" campaign as conducted under the auspices of the Pacific Coast Gas Association.

Practically every tried and proven medium is being utilized. The largest item of expenditure is for display space in five Los Angeles daily newspapers which have a combined circulation reaching into the hundreds of thousands and covering practically all of the territory served by the three companies. Each day—for five days a week—some Los Angeles daily carries a 39-column-inch display space presenting the convenience, the economy, the speed and the dependability of natural gas. Ordinarily this space is three columns wide by 13 inches deep.

The second item in the program is for a "half-showing" of natural gas posters on billboards throughout Los Angeles County. This means a total of 263 boards. Six of these posters already have been contracted for, each to appear for one month.

The newspaper space—with the exception of four weeks in the year—and the outdoor advertising, are directed to the domestic consumer. Business interests of the community are being reached through the liberal use of space in such publications as Southern California Business, Los Angeles Realtor, Western Restaurant, and Pacific Coast Record. This business or trade journal advertising is to be co-ordinated with the co-operative program of the Pacific Coast Gas Association, which is somewhat limited in circulation and which must, of necessity, cover the West Coast gas industry as a whole, whereas copy of the three companies gives its entire emphasis to *natural* gas. During four weeks of the year the newspaper space will be directed to industrial or commercial natural gas utilization.

Ten pieces of direct mail are to be prepared during the year for the use of the three companies in covering selected lists of industrial and commercial consumers. These will deal specifically with the use of natural gas for major industrial utilization.

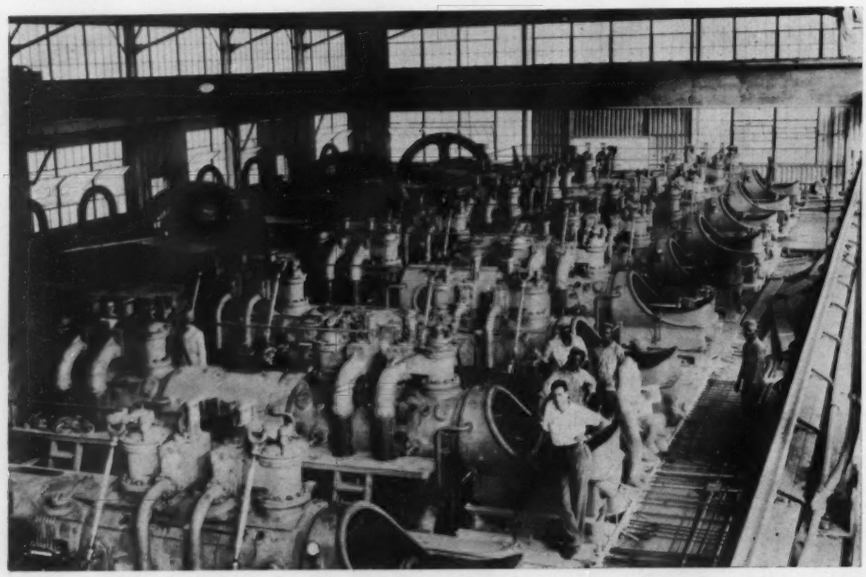
A fourth phase of the campaign touches the national field. Up to the present time no natural gas story for southern California has been presented through the advertising pages of national magazines. Tying in with the Los Angeles Chamber of Commerce campaign of national advertising, which portrays the many advantages of southern California, the three companies have contracted for two pages during the year in each of the following publications of national circulation: Business Week, Time, Forbes, World's Work, Review of Reviews, Fortune, Nation's Business, Scientific American, Factory & Industrial Management, Atlantic Monthly, and Traffic World. The first copy is to appear in the April issues of this group of magazines.

While two of the three companies which are participating in this joint campaign — Southern California Gas Co. and Southern Counties Gas Co.— engage in the merchandising of natural gas appliances, none of the copy appearing over the signatures of the three companies mentions or gives preference to any specific gas appliance by name or other distinctive feature.

On the other hand, every piece of newspaper copy and every billboard calls attention to the fact that modern gas appliances and information concerning them may be obtained from "your plumber, local merchant or gas company." Many dealers are watching the development of the campaign with interest and many of them already feel assured of a substantial increase in their own business through this joint advertising effort.

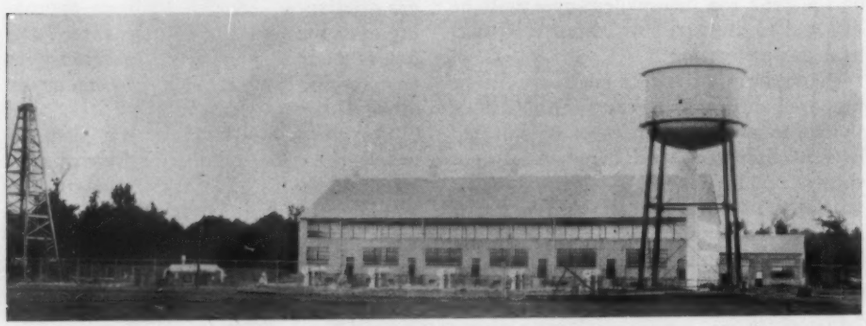
Of course emphasis is placed upon the Blue Star Seal of the American Gas

(Continued on Page 40)



Engine room from crane level, showing battery of 5 twin-tandem direct-connected Worthington compressors.

View showing main building of the plant while under construction. Note the hot well and discharge line at right.



Main building, water tank and auxiliary building, construction completed. Scrubber shown at left of main building.

Views of the Pickens Compressor Station recently put in service by the Southern Natural Gas Corporation.

Design of the Pickens Plant

By CHARLES W. MERRIAM JR.

ANTICIPATED peak load demands on the pipe line system of the Southern Natural Gas Corp., necessitated the construction of a natural gas compressor station at Pickens, Miss., with an initial installation of 6,250 h.p. In order to complete this project, field work by and under the supervision of the Natural Gas Engineering Corp., extended over a continuous period of 183 days, ending December 15, 1930. The Pickens station, the nearest compressor to the wells, is located on the 22-in. O. D. main gas line 123.1 miles east of the field receiving point in the Monroe, La., gas producing area and 119.4 miles west of the next compressor station on the main line at Reform, Ala.

Due to the dependability of service required by main line units and to the high station load factor, design of the Pickens Station gave unsual consideration to reliability, economy, and facility of operation. Calculation of peak day demand during the winter of 1930-31 indicated that equipment must be provided to compress approximately 102,000,000 cubic feet of gas per day from 163.7 lbs. per sq. in. abs. to 409.1 lbs. per sq. in. abs. Inasmuch as the main transmission line was constructed with pipe of a wall thickness capable of withstanding a maximum working pressure of 400 lbs. per sq. in. gauge with a safety factor of 4.3., the maximum allowable compressor discharge was assumed not to exceed this pressure.

In view of the expected increase of gas sales in future years the limits of distance along the pipe line, either east or west, in which the station might be located were comparatively small if disadvantageous compressor ratios were to be avoided. Selection of the Pickens site was made because its location permitted the favorable, ultimate, compressor ratio of 2.5, proximity to a railroad, and promise of an excellent water supply. Complete detail drawings were furnished

Compressor Station: *A* Modern Serving Southern Natural

Southern District Manager
Natural Gas Engineering Corporation

to the field construction forces to assist precision of erection. General layout of the station contemplated an ultimate installation of 12 compressor units.

The present Pickens station includes 5 twin tandem, natural gas driven, four-cycle double acting units with 36 in. stroke, 24 in. diameter power cylinders and 15½ in. diameter compressor cylinders, manufactured in the Buffalo Works of the Worthington Pump & Machinery Corp. These direct connected compressors operate at a maximum of 125 r.p.m.—or a piston speed of 750 ft. per min.—and a minimum of 65 r.p.m. The total shipping weight of these engines was approximately 200 tons each with overall dimensions of 54 ft. 3½ in. length, 21 ft. 1½ in. width, and 12 ft. 6 in. diameter flywheel. Fig. 1 indicates the manufacturer's minimum guarantee of crank horse power and daily capacity with variable intake pressures and with a constant discharge pressure of 400 lbs. per sq. in. gauge. The manufacturer guaranteed a full load fuel consumption of 10,000 B.t.u. per b. h.p. which permits a gas consumption for compressor purposes of 1.25 per cent of the total gas pumped at a 2.52 compressor ratio. Belt driven governors of the enclosed centrifugal type control the amount of mixture admitted to each valve. High tension, jump spark ignition is supplied through two plugs in each cylinder end. Ignition timing is effected at the rear of each layshaft by means of a visible, rotating distributor case from 12-volt storage batteries. Hand operated unloaders are located in the outboard end of each compressor cylinder. A special ring wiper removes the drip oil from the rod into a separate drain at the rear of the inboard side of each compressor. Garlock Chevron packing is used on compressor piston rods and fiber gaskets on both compressor heads.

C. W. Merriam, Jr.

The main building, 68 ft. by 156 ft. with nine bays, is of riveted steel construction sheeted with ¼-in. asbestos "Eternite" siding of 7 in. corrugation. Door jams and window frames are flashed with material similar to the siding. The engine room floor is 3.75 ft. above, and the basement floor 4.25 ft. below the station grade. The main building structural columns are grouted in at the engine room floor level with the siding lapping over a bevelled, 1-ft. floor curbing. The five compressor units are set on 26-ft. centers with supporting blocks extending into the basement mat. A hand operated 7½-ton Maris crane runs on rails 14 ft. above floor level. Beams protruding from the engine blocks support the beams of a separately poured floor, thus allowing movement of the engine without cracking floors or shaking of the building. Engine blocks are separated by a shallow spacer at the basement floor level. A single power exhaust line on each of two engines is sheeted to form a duct through which air is forced by a 1-h.p. blower to warm the building through a grating in the floor. In the roof over each unit, a 42-in. Swarthout ventilator is installed.

Outside concrete walls are carried down to basement level leaving the basement entirely open except for the engine blocks, for pipe work, and other equipment. Slotted steel floor grating is placed between layshafts of each unit allowing considerable natural light and aiding ventilation in the basement. Embedded in each engine block are 14-in. diameter free air headers with separate ducts leading to each cylinder mixing chamber. Under the floor grating in the center of each unit a 24-in. fuel gas flow equalizing header is located which is controlled in turn at the starting stand

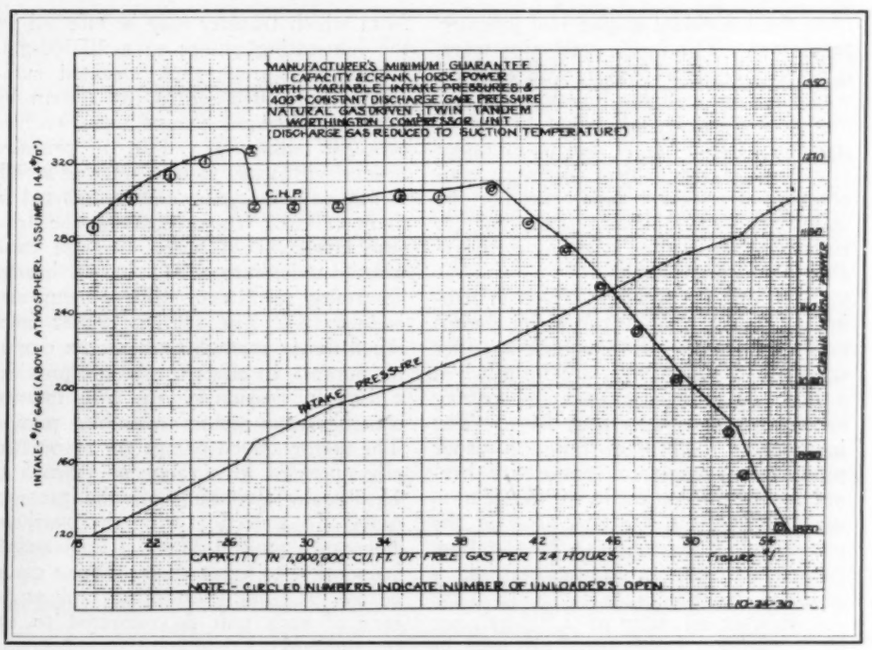
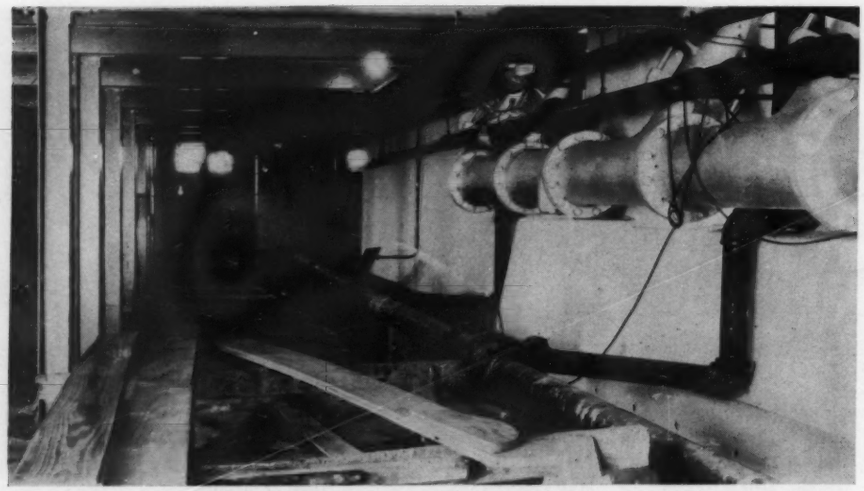
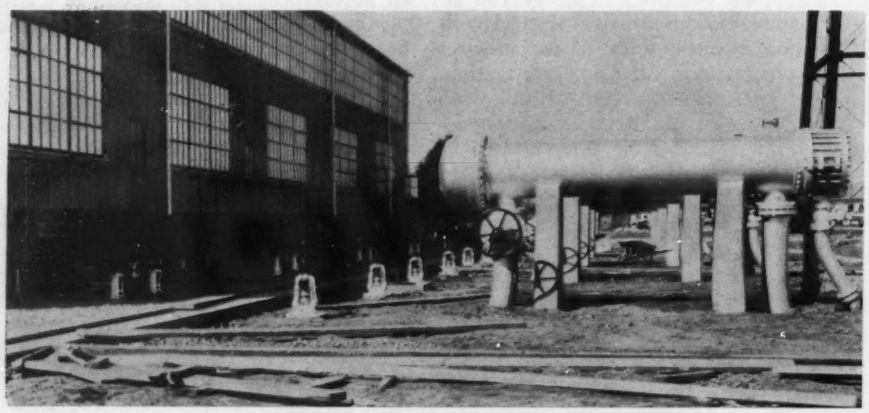

MANUFACTURER'S MINIMUM GUARANTEE
CAPACITY & CRANK HORSE POWER
WITH VARIABLE INTAKE PRESSURES & 400# CONSTANT DISCHARGE GAGE PRESSURE
NATURAL GAS DRIVEN TWIN TANDEM
WORTHINGTON COMPRESSOR UNIT
(DISCHARGE GAS REDUCED TO SUCTION TEMPERATURE)
C.H.P.
INTAKE PRESSURE
CAPACITY IN 1,000,000 CU.FT. OF FREE GAS PER 24 HOURS
NOTE - CIRCLED NUMBERS INDICATE NUMBER OF UNLOADERS OPEN
FIGURE 1

Fig. 1



Basement, at end from which future extension is planned. Discharge water line is shown at floor level, and side of engine block on right.



View showing pipe and valve yard and gas coolers.

from the individual engine fuel pressure regulators. The inside steel pipe work is practically all welded and all exposed water piping is flanged cast iron, this minimizing leakage attendent to use of screwed or lead joints due to excessive vibration. Lines subject to severe temperature stresses are cased through the walls. Outside mufflers rest on concrete embedded angle irons allowing considerable sliding movement.

The three direct motor driven Worthington No. 15-A lubrication oil pumps and a 420-gallon pressure tank together with starting apparatus are installed in a 12-ft. by 20-ft. lean-to house opening onto the engine operating floor. The intervening wall is of fire and vapor proof construction to reduce fire hazards. In the basement of the lean-to which opens into the pipe alley at the power end of the engines, a 2,000-gallon, two-compartment precipitation tank is installed, together with a No. 12 Type AP Bowser oil filter of 1,500-gal. per hr. capacity. Lubricating oil may be delivered on the siding in a tank car from which transfer may be effected by the lubricating pumps to a 10,000-gal. horizontal storage tank elevated sufficiently to return oil to the system by gravity. The oil pumps work on the pressure tank into a 3-in. oil pressure header with leads to each starting stand. A 400-gal. emergency tank supported in main building trusses floats on the pressure header. Oil passes through compressor units into a 3½ in. oil header returning to filters. The system also includes a 2½-in. suction header from the filter or storage tank to the engine oil pumps. In effect the layout provides a dual lubrication system with manual control from motor to engine pumps. The motor driven pumps are automatically operated in a range of from 5 to 15 lbs. by switching off the pressure tank. In conection with the overhead emergency tank, a Mercoid float switch is operative to lights on the station gauge board. A 1-bbl. cylinder oil tank at the rear of each unit is connected to the storage tank.

An auxiliary building, 30 ft. by 60 ft. of the same general type of construction as the main building, houses the machine repair shop and the auxiliary electrical and air starting equipment. The repair shop is equipped with the following individual motor driven equiment:

A 24-in by 18-ft. Monarch lathe, a 6-in. Oster pipe machine, a 12-in. double wheel grinder, a 24-in. Champion drill press, a 6-in. by 6-in. high speed Peerless hack saw, and a 20-in. Smith & Mills shaper. One of the two 7/6 by 6 Worthington, 2-stage air compressors is driven by a 25 h.p. gas engine; the other by a belted 20-h.p. squirrel cage motor. A 60-cycle, 3-phase, 220-volt, 156 kva. alternator is driven by a 4-cylinder, 4-cycle, vertical, 12¼-in. by 5-in. gas engine at 277 r.p.m. The auxiliary building also includes the station switchboard which connects, among other points, with the transformers of a 13,000-volt line of the power company. Batteries and 2-motor generator sets are installed in the auxiliary structures. Dual ignition systems are connected from the switchboard to each compressor engine. All gas, water, and air lines are in a floor trench covered with steel grating inside the building.

WATER SUPPLY

Water is supplied from two wells of unusual character approximately 1,416 ft. deep through an 8-in. casing with a 16-in. top. These wells came in at 460 g.p.m. simultaneous open flow with a closed in pressure of 31 lbs. A Layne-Central 1170 r.p.m. deep well pump of 800 g.p.m. capacity against a 70-ft. head, direct connected with 40-h.p. motor in each well, discharges into a line supplying the gas discharge coolers which in turn feed to engine water jackets. A 100,000-gal. tank whose top water level is 68 ft. above station grade is floated on this line with an overflow connection to the hotwell. A Griscom-Russell No. 127-168 Vaneflo gas cooler with 1750 sq. ft. surface is installed on the discharge of each compressor unit in such a manner as to permit gas from any unit to be passed by means of a 12-in. transfer header through any cooler. The flow of water through the engine jackets is controlled at the starting stand. Waste water is collected in a concrete hotwell with a 15-in. tile line draining 1,564 ft. to the Black River.

The intake and discharge gas headers are 20-in. O.D., extra heavy, with a horizontal, centrifugal, dry scrubber to facilitate removal of possible water and dirt from the intake line. Intake and discharge lines to each engine have double gates to insure cut off. Each engine is by-passed and a 3-in. safety valve blowing off at 425 lbs. per sq. in. is in each compressor discharge line. Gas is

(Continued on Page 54)

Rapid Load Building *through the* Conversion Burner

By JAMES A. BELL

Supervisory Commercial Manager
The Kansas Pipe Line & Gas Company
Salina, Kansas

LOAD-BUILDING has proceeded at an astonishing rate on the Kansas Pipe Line & Gas Co. system, since the utility's commercial department was organized a little over two years ago. Mr. Bell describes the part played by the conversion burner in this growth. His remarks were originally presented before the Mid-West Regional Sales Conference, which held session at the Hotel Sherman, Chicago, Ill., February 12 and 13.

—Editor.

THE Kansas Pipe Line & Gas Co. is a straight gas company distributing 1050 B.t.u. natural gas to some 60 towns throughout central Kansas. Our largest town has a population of 22,000, our next largest 10,000, and from this on down to very small villages.

The territory through which we operate is an agricultural section, and our small towns especially are made up largely of retired farmers.

We have, at the present time, approximately 20,000 meters, a considerable number of which were added during a special campaign which was conducted during September and October of last year. We had at the beginning of 1930 approximately 11,000 meters so we estimated that our average number of meters for last year was approximately 15,000.

Our gas rate is a step rate, as follows: First M.c.f.—$1.50; next 19 M.c.f.—50c. per M.; next 80 M.c.f.—40c. per M. The rate then drops down into the industrial steps. From the above rate it may be seen that our house heating gas sells for about 47c per M., which compares favorably with other fuels in our territory.

Our company is divided into three divisions and we have a commercial manager located at each division office whose duty is to supervise the commercial activities throughout his division. Our territory salesmen work directly under the supervision of a commercial manager and cover a territory consisting of approximately 1000 meters. In laying out territories in new situations we try to arrange it so the potential is at least 1000 meters. The smaller number of meters on the new territory is easily offset by the greater possibilities of virgin territory.

Our territory salesmen handle our full line of appliances, including house heating and commercial jobs on their respective territories. We have no specialty salesmen. We have one industrial engineer working out of the general office and covering the entire group of towns. He conducts schools for the salesmen as well as the service and installation men covering heating in all of its various phases, burner application, combustion, etc. In addition to this he figures and checks the larger jobs and renders assistance generally when trouble is encountered.

The properties of The Kansas Pipe Line & Gas Co. are less than three years old and the Commercial Department is a little over two years old. Five of our largest towns had manufactured gas prior to the time we brought natural gas into this territory and the other towns were all new.

During 1929, which was our first full year of commercial activity, we sold and installed 1252 central house heating jobs of which 96 per cent were conversion burners and 4 per cent gas designed furnaces and boilers. During 1930 we sold and installed 1803 central house heating jobs of which 90 per cent were conversion burners and 10 per cent were gas designed furnaces and boilers.

It is generally conceded by those who have had any experience with the problems of gas house heating that the ideal installation is the gas designed central house heating plant. It is obvious that gas designed equipment properly selected and installed insures the lowest operating cost.

In our situation, however, where a broad house heating program had been determined upon it was naturally our desire to connect this heating load as quickly as possible. We feel that in such situations the conversion burner is vitally necessary for rapid load building.

There are a number of things which retard the sale of gas designed, central house heating equipment in localities where the consumers are unfamiliar with gas as a major house heating fuel:

1. Fear that the gas supply is not dependable.
2. Fear that gas will not heat like other fuels.
3. Fear of high cost of operation.
4. Unwillingness to make the large initial investment in gas designed equipment and dispense with the present coal furnace which is in good condition.
5. The renter who desires equipment of low cost which is portable and capable of being conveniently reinstalled.

It is evident, from the above objections to gas designed equipment, that the conversion burner will aid us very materially in a rapid load building program, provided the gas rate compares favorably with other fuels.

In the first case, "Fear that the gas supply is not dependable," the consumer may be shown that in the event the gas supply should fail it requires only a few minutes to remove the gas burner and put his heating plant back in condition to burn coal. This fact, we have found, carries considerable weight.

The second objection, "Fear that gas will not heat like other fuels," can easily be overcome by the same argument, since in practically all cases it is only necessary to get the consumer to try gas for heating in order to convince

(Continued on Page 52)

A Comparison *of* Natural Gas *and* Coal Combustion

By P. McDONALD BIDDISON

Consulting Engineer
Southern Natural Gas Corporation

MR. BIDDISON will be well remembered by *Western Gas* readers for several important contributions to natural gas literature—chiefly in the field of gas transmission. "Limiting Factors for Natural Gas Pipe Line Projects," and "Economics of High Pressure Transportation for Natural Gas Pipe Lines" are titles of two studies prepared for A.G.A. Natural Gas Department programs — the first published in *Western Gas* for June, 1928, the second in March, 1929. His description of the Southern Natural Gas Corp. line from Louisiana into Mississippi, Alabama, and Georgia, also appeared in the February, 1930, issue.

P. M. Biddison

Now the same writer turns his pen to a thorough-going analysis of gas utilization economics, as compared to coal use—a topic which has special meaning at this time when natural gas is penetrating numerous established coal markets.—*Editor.*

IT cannot be truthfully said as a general statement that one fuel can be burned more efficiently than the other. The question of relative efficiencies is one for specific determination in each case and will depend upon character of use and the facilities for conversion of the fuel into useful heat. Fernald & Orrok, in "Engineering of Power Plants," quote Whitham from an A. S. M. E. paper to the effect that "Efficiency as high as from 72 per cent to 75 per cent is seldom obtained (with gas) under most expert conditions," and "Air dilution is greater with gas than with coal, so possible coal efficiencies are impossible with gas." Coal men have made much of this quotation despite the fact that the data of Whitham was published in 1905, 25 years ago, when gas was sold with little, if any, effort at service to the consumer, like coal is now sold, and sold further with little engineering skill having ever been applied to the problems of efficiency in its use. It was sold, therefore, largely for use under conditions poorly adapted to secure advantageous application or efficient use. Twenty-five years has produced marked changes in this respect, and the statements by Whitham are not true of present-day conditions and were disputed by contemporaneous authorities in 1905.

Whitham does not show in his paper any results of firing with coal under the same boilers in which he made the tests with gas. Since the peculiarities of a boiler installation affect the efficiency obtainable with any fuel, conclusions cannot be made general except from comparative results on plants of identical characteristics as to size, furnace volume, percentage of rating, draft, condition of tubes, feed water temperature, steam pressure, superheat, air infiltration, etc. There are so many of these factors that practically it requires comparative tests in identical installations to enable one to make conclusive comparisons. The validity of the conclusions drawn by Whitham was challenged at the time by Prof. E. A. Hitchcock of Ohio State University, who cited tests of gas against coal under a B & W boiler in a large lighting plant, four days' operation with variable load showing 75 per cent efficiency for gas and 59 per cent for coal. Hitchcock concludes, "in some cases with bituminous coal the efficiency will be lower than with natural gas, and judging from results of several years' experience in testing and investigating plants in this section of the country, I believe such would be the general rule"; and "It seems to me that almost ideal conditions should be obtained in the burning of gas with very little excess air."

In a discussion of Whitham's paper, J. Rowland Brown (who was quoted by Whitham) states, "There is every reason to believe that efficiencies should be higher in a gas furnace than in a coal furnace"; and "There should be no large excess of air with a gas furnace, while with hand-firing, and also with most makes of stokers, the excess of air is a serious problem."

Marks' Mechanical Engineers Handbook, page 945, 1924 edition, quotes Prime Movers Committee Report, N. E. L. A. (1921) on a 1263 H. P. boiler 80.0 per cent efficiency on natural gas with 15 per cent excess air. Marks further states on page 948, "In tests with low volatile bituminous coals where similar* high efficiencies were secured these ratios were from 1.20 to 1.26 to 1," the ratios being the ratio of air supplied to that theoretically required. Marks further reports 40 per cent excess air for high efficiency for high volatile coal and 11 to 22 per cent excess air for powdered coal under conditions of highest efficiencies and concludes that these figures being test results, the air excess will be even higher in usual operating conditions.

It is true that coal under certain conditions may theoretically produce a flame of higher temperature than natural gas, but whether one actually produces a higher flame temperature than the other depends upon the method of firing, and it is only actual flame temperature, not that theoretically obtainable under ideal conditions, that has any bearing on the possible efficiency of firing. Comparative results obtained in use, each under the best conditions of firing for the particular fuels, provide the answer as to whether the higher flame temperature theoretically obtainable with some coals produces any benefits to the user. There are some special cases where the substance to be heated is to be heated to extremely high temperatures, where difference in flame temperture has given coal or oil a distinct advantage over natural gas. On the other hand, there are some special cases where the products of combustion may be cooled to 212 degrees or lower, where natural gas may, by utilization of the latent heat of the relatively large water vapor content in the flue gases, produce efficiencies unapproachable with coal. This latent heat of the water vapor in

* The word "similar" here refers to highest authentic efficiencies secured with oil-firing.

the products of combustion, which heat is not recoverable unless the products of combustion are cooled below the dew point, accounts for the difference between what is known as "the higher heating value" (sometimes called "the total or gross heating value") and "the lower heating value" (sometimes called "the net heating value"). The greater the total hydrogen content of a fuel the greater will be the difference between the higher and lower heating values. The combustion of methane produces 2.248 pounds of water vapor per pound of methane (Gas Chemists Handbook—A. G. A. 1929), which, since 1 pound of methane occupies 23.565 cubic feet at 30 inches and 60 degrees, is equivalent to 95.4 pounds of water vapor per thousand cubic feet of methane. The heat content difference per pound of water vapor at 30 inches between 60° and 562° stack temperature is (212—60)+ 970.4 + (562—212) × .4605 or 1284 B.t.u. For 95.4 pounds it amounts to 122,495 B.t.u., which represents the heat not recovered from the water vapor produced by 1,000 cubic feet of methane for stack temperature of 562 degrees. (The specific heat of steam, .4605 for these conditions, from Marks' Mechanical Engineers Handbook, page 337, 1924 edition). The lower heating value is seldom used. In engineering practice efficiency figures are based upon the higher heat value and gas, as well as coal and oil, is sold on the basis of the higher heat value. For a gas of 1,000 B.t.u. higher heating value, at 30 inches and 60 degrees, the customer receives, when deliveries are made at 8 ounces gauge pressure above a barometer of 14.4 pounds (which is a common delivery pressure),

$$1{,}000 \times \frac{(14.4+.5)}{14.693}$$

or 1014 B.t.u. per cubic foot of gas, as received and paid for. He may use this gas in many ways, but the efficiency of his use is always based on this higher value. If based on such higher value, he develops an efficiency of 80 per cent and the lower heating value is 90 per cent of the higher heating value, then the efficiency relative to the lower heating value is

$$\frac{80}{90}$$

or 88.889 per cent. It really makes no difference which be used so long as it is known which is used. It is standard practice to refer all efficiencies to the higher heating value, and thus when we talk of efficiencies we use the lower of the two efficiencies.

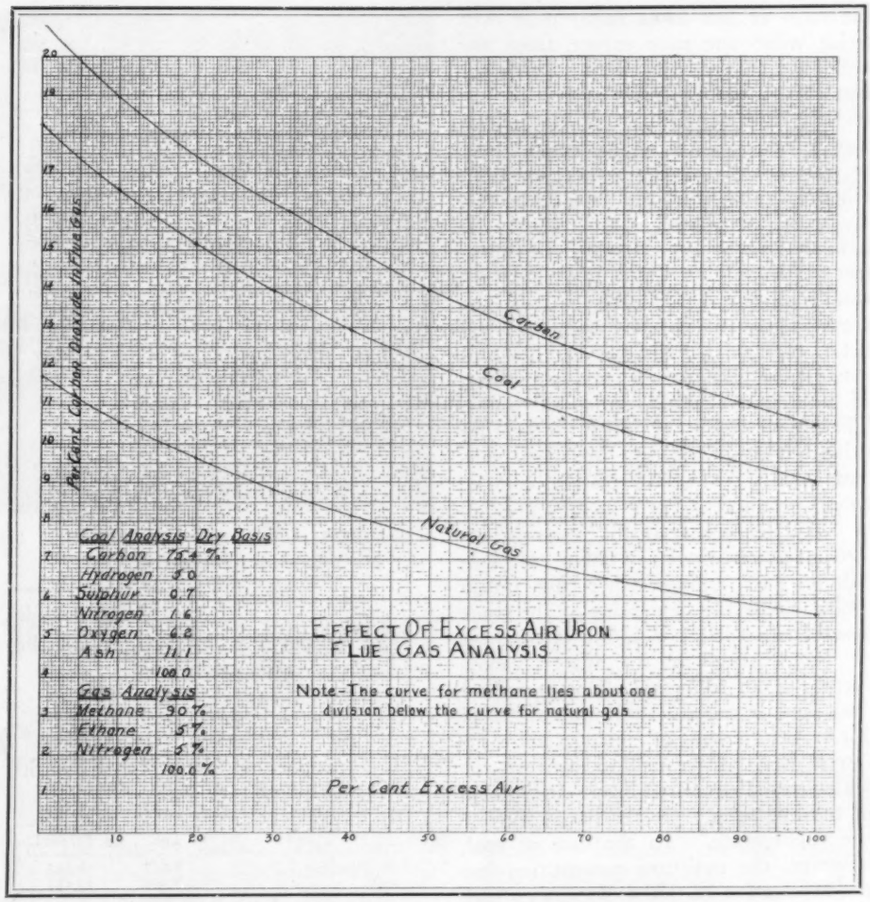


Fig. 1.

Moisture in Coal

Now, for coal-firing the heating value to be used is the higher value, and in addition to the hydrogen in the coal that is to be converted to water vapor and heated to the stack temperatures, there is a water content in the coal varying with the class of coal and the amount of drying or wetting it undergoes from the time of shipment to the time of use by the user from 3 per cent to 10 per cent. This water must be evaporated into steam at the stack temperature. The amount of heat required to so convert this moisture content from 60 degrees to 562 degrees is per pound of moisture (212 — 60) + 970.4 + (562 — 212) ×.4605 or 1284 B.t.u. For each per cent of moisture in the coal there is .01 pounds of water in the coal requiring 12.84 B.t.u. For 5 per cent moisture this amounts to 64.20 B.t.u.'s. A good bituminous steam coal contains, by anlysis, usually in excess of 5 per cent of hydrogen by weight or .05 pounds of hydrogen per pound of coal. Each pound of this hydrogen forms 9 pounds of water vapor or 0.45 pounds of water vapor per pound of coal. Each pound retains, as it goes out of the stack at 562 degrees, (212 — 60) + 970.4 + (562—212)×.4605 or 1284 B.t.u.'s. On 0.45 pounds this is 578 B.t.u.'s per pound of coal loss through hydrogen content, which with 64 B.t.u. loss from 5 per cent water content amounts to 642 B.t.u.'s of unrecoverable heat per pound of coal, or 5.13 per cent of the heating value of coal of 12,500 B.t.u. heating value dry basis. If the coal be nearly saturated, as is common in small installations, and the moisture content be 10 per cent, then the losses due to water content are 128.4 B.t.u.'s per pound of coal, which with 578 B.t.u. loss per pound, due to 5 per cent hydrogen content, amount to 706 B.t.u.'s per pound of coal, or 5.65 per cent on coal of 12,500 B.t.u.'s per pound dry basis. When one compares this to 123 B.t.u.'s per cubic foot losses to stack from the same sources for methane

$$\frac{123 \times 100}{1016} = 12.1\% \text{ loss}$$

the ratio of loss looks high; it is over twice what one may expect from the same sources of loss with coal-firing. But this is not the only source of loss of heat in boiler-firing, and the advantage which coal has in this respect may be, and usually is, more than offset in other respects, and the loss from this source is just as real in the case of coal as in the case of gas. Now, 25,000 cubic feet of gas of 1,000 B.t.u. per cubic foot would contain 25,000,000 B.t.u.'s, the same amount of heat as 1 ton of 12,500 B.t.u. coal (dry basis for coal). This amount of gas would produce about 25 x 95.4 or 2,385 pounds of water. The ton of coal of 12,500 B.t.u. heating value having 5 per cent hydrogen content and 5 per cent moisture content would produce (.05 x 9 + .05) x 2,000 or 1,000 pounds of water vapor in the stack. The hydrogen in either case contributes heat, and in either case, unless cooled below the dew point of the stack gases (below 212° F.), the latent heat of vaporization of the water vapors formed is not recovered. But in neither case does it require the input of 970.4 B.t.u. per pound of such vapor (the latent heat of steam) to convert the water vapor produced from combustion of the hydrogen from the liquid state to the vapor state. In the case of coal, however, the moisture content requires the application of 970.4 B.t.u.'s to each pound thereof to convert it from liquid to vapor.

The above discussion in no way attempts to set out a full comparison of the respective inherent heat losses of coal and gas. This involves the question of heat losses through stack for the entire volume of the products of combustion, including the air required for combustion, the excess air, and the losses through grates and other factors.

The sale of natural gas has been most easily made when the buyer was in possession of the facts as to processes of combustion and had enough technical knowledge to digest and analyze the data. It is through such analysis that gas is sold in competition with coal. The natural gas salesman often finds instances where his fuel can not be sold in competition with the coal available, but his greatest difficulties in effecting sales are with those who do not know the heating value of the fuel being used or the efficiency with which it is being used.

Carbon Combustion

As used generally in engineering computations (Principles of Combustion in The Steam Boiler Furnace, Arthur D. Pratt, Fourth Issue) air is composed of:

	Per Cent by Volume	Per Cent by Weight
Oxygen	20.91	23.15
Nitrogen	79.09	76.85
Ratio Oxygen to Nitrogen	3.78	3.32

In burning 1 pound of carbon to carbon dioxide (complete combustion, no excess air) 12 parts by weight of carbon combine with 32 parts by weight of oxygen to form 44 parts by weight of carbon dioxide or each pound of carbon requires 2.667 pounds of oxygen, or 11.521 pounds of air. The resulting products of combustion will be 12.521 pounds, composed of

Carbon, 1.000 pound	
Oxygen, 2.667 pounds	
Forming Carbon Dioxide	3.667 pounds
Nitrogen 3.32 pounds per pound of Oxygen	8.854 "
	12.521 pounds

The proportions by weight of the products of combustion are

Carbon Dioxide	29.3
Nitrogen	70.7

The proportions by volume at 30 inches and 60° F. are

	Lbs.	Cu. Ft. per Lb.
Carbon Dioxide	3.667	8.548
Nitrogen	8.854	13.443
	12.521	

	Cu. Ft.	Per Cent by Volume
Carbon Dioxide	31.346	20.9
Nitrogen	119.024	79.1
	150 370	100.0

At 100 per cent excess air we would have approximately

	Cu. Ft.	Per Cent by Volume
Carbon Dioxide	31.346	10.45
Nitrogen 2 × 119.024	238.048	79.10
Oxygen	31.346	10.45
	300.740	100.00
At 50 per cent excess air, approximately		
Carbon Dioxide	31.346	13.95
Nitrogen 1.5 × 119.024	178.536	79.10
Oxygen	15.673	6.95
	225.555	100.00
At 10 per cent excess air, approximately		
Carbon Dioxide	31.346	18.95
Nitrogen 1.10 x 119.024	130.926	79.15
Oxygen	3.135	1.90
	165.407	100.00
At 16 per cent Carbon Dioxide in flue gases		
Carbon Dioxide	31.346	16.00
Nitrogen	154.966	79.10
Oxygen	9.600	4.90
	195.912	100.00

And the excess air (computed from the Nitrogen content with no excess air) is

$$\frac{(154.966-119.024)}{119.024} \times 100 \text{ or } 30.18\%$$

Methane Gas Combustion

Now, in burning methane under the same conditions of excess air as above we would have an entirely different flue gas analysis. The water vapor formed does not show in the flue gas analysis from either coal or gas firing since it is condensed in obtaining the sample in the usual analysis.

One cubic foot of Methane produces

	Cu. Ft.	Per Cent by Volume
In perfect combustion		
Carbon Dioxide	1.00	11.675
Nitrogen	7.565	88.325
	8.565	100.000
At 100 per cent excess air		
Carbon Dioxide	1.000	5.51
Nitrogen 2 x 7.565	15.130	83.47
Oxygen 1.0 x 2.0	2.000	11.02
	18.130	100.00
At 50 per cent excess air		
Carbon Dioxide	1.000	7.50
Nitrogen 1.5 × 7.565	11.347	85.00
Oxygen 0.5 × 2.0	1.000	7.50
	13.347	100.00
At 10 per cent excess air		
Carbon Dioxide	1.000	10.5
Nitrogen 1.10 x 7.565	8.322	87.4
Oxygen 0.10 x 2.00	.200	2.1
	9.522	100.0
At 30.18 per cent excess air		
Carbon Dioxide	1.000	8.73
Nitrogen 1.3018 x 7.565	9.848	86.00
Oxygen 0.3018 x 2.0	0.604	5.27
	11.452	100.00

Comparing the carbon dioxide percentage in flue gas analysis for the same conditions of excess air for burning carbon and methane we have

Excess Air Per Cent	Per Cent Carbon Dioxide in Flue Gas Carbon	Methane
0	20.9	11.675
10.0	18.95	10.50
30.18	16.0	8.73
50.0	13.95	7.50
100.0	10.45	5.51

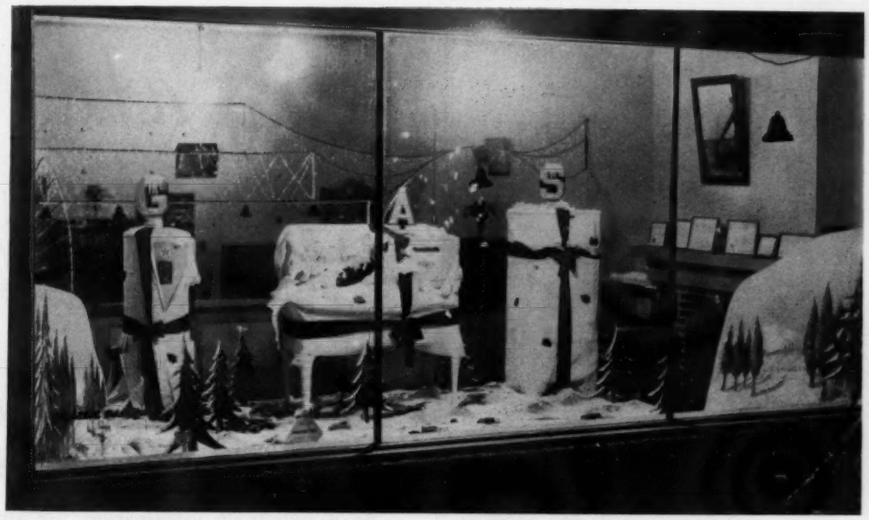
Gas and Coal

Now let us compare the products of combustion of coal to those of natural gas in the same way we have compared carbon to methane, neglecting the carbon monoxide produced from incomplete combustion of some of the carbon (a condition prevailing in coal-firing to a much greater extent than in gas-firing). For this purpose we will assume coal and gas of the analysis shown below:

COAL ANALYSIS

	Dry Basis	At 5% Moisture
Carbon	75 4%	71.63
Hydrogen	5.0%	4.75
Sulphur	0.7%	0.665
Nitrogen	1.6%	1.520
Oxygen	6.2%	5.890
Ash	11.1%	10.545
Moisture	0.0%	5.000
	100 0%	100.000

The heating value (higher value) may be calculated *(Continued on Page 48)*



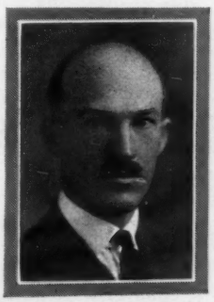
Window display at Monrovia office of Southern Counties Gas Co., carried during special range event. The display was accorded honors in a holiday window contest conducted by the local merchants' association.

This Year-End Campaign Added Range Users

By CLYDE H. POTTER

Commercial Manager
Southern Counties Gas Company

AS a wind-up to its year of merchandising, the sales department of the Southern Counties Gas Co. laid plans late in 1930 for bringing pressure to bear upon gas range prospects. The company, serving several score of communities in southern California, with its headquarters in Los Angeles, for the past several years has conducted annual inter-district sales contests, with four districts ranged on opposing sides. The special gas range sale was handled as a part of the regular contest, resulting in raising the total of merchandise sales for all districts above the total which might have been expected through routine selling.



Clyde H. Potter

One consideration prompting the range sale was the gift appeal which can be made to play an important part in the purchase of this commodity. With Christmas at the end of the campaign, salesmen could logically call for a share of the holiday dollar. The desire to cook Thanksgiving, Christmas and New Year's dinners on a brand new appliance could figure in the buying motive.

Maintaining quality of merchandise sold on its lines has been a guiding standard with Southern Counties, and this thought was emphasized in the range drive. Indicating the success met with in this particular, sales averaged $100.70 net per range during campaign dates.

It was recognized, because of the general slowing up in buying volume, and because the selling was to be done in the pre-holiday period, that some strong inducements should be placed at the disposal of the sales force, if results were to be achieved. Therefore it was decided to offer a premium with each purchase, and to make installment payments unusually attractive to buyers during the campaign.

A nine-piece aluminum cooking set was selected as premium, to go to each purchaser of an oven heat controlled range—emphasizing again the sale of high type merchandise.

Five dollars down, and the balance in small monthly payments with the gas bill was the pay-plan chosen for the range drive.

The premium was only made available during a portion of the campaign. November 10 to November 26. The sale opened on November 10, and closed on December 20. It was felt that the premium would send the salesmen off to a good start, and that the acquired momentum, plus some special prizes for sales accomplishments, would carry it through.

Thirty salesmen were included in the range selling, and a list of eight cash prizes was arranged for special award. Prizes totalled $150, first award being $50. A $20 prize was posted for the district commercial agent who had the highest sales per meter on his system.

Southern Counties salesmen work on a territorial basis, each man being responsible for sales to from 4,500 to 5,000 meters. Through this means, salesmen are able to learn the needs of their territories, and when a special appliance is selected for featuring, can take campaign offers direct to prospects for that appliance, with a minimum of waste motion.

(Continued on Page 50)

ONLY FOUR MORE DAYS
of our special
PRE-THANKSGIVING
SALE
ONLY $5.00 DOWN
For your choice of any oven-heat controlled range in our stock.
TERMS AS LOW AS $5.00 A MONTH
FREE—
With each oven-heat-control range sold before next Wednesday evening, we shall include a nine piece set of heavy aluminumware for oven cooking. This set retails for $12.00. With it you may cook, roast, bake—an entire meal on a single burner.
SOUTHERN COUNTIES GAS CO

Newspaper copy stressed holiday appeal.

Terr. No._____ **DOMESTIC INSPECTION CARD** W ☐ or C ☐ Renter ☐ or Owner ☐ Res. ☐ Apt. ☐ or Bus. ☐

DATE_____

APPLIANCE	GAS	ELECT.	COAL	OIL	NAME OR TYPE	CONDITION	PROSPECT	REMARKS
RANGE								
REFRIGERATOR								
WATER HEATER								
INCINERATOR								
FURNACE								
SPACE HEATER								
WASHER								
DRYER								
IRONER								
LAUNDRY STOVE								
ATTITUDE								
INVESTOR								

Address_____ Name_____

S2165–20M-8-30

Street

HOUSE NUMBER	Name of Occupant	Occupation	Date	Owner	Dwel Service	Number of Rooms	Basement	Furnace	W. S. or A. Heating	Radiant Heater	Gas Radiators	Encl. Space Heater	Refrig.—E. L. or G.	Water Htr.—T.S. or I.	Gas Range	Hot Plate	Attitude	Laundry	Incinerator	Investor
	Remarks																			
	Remarks																			
	Remarks																			
	Remarks																			
	Remarks																			

ALL INFORMATION REQUESTED IS IMPORTANT—KEEP YOUR CANVASS BOOK UP TO DATE

UPPER: Card file form used by Southern Cities Distributing Co. LOWER: Form for recording prospect data secured by salesmen in a canvass of their territory.

Sales

By C. B. WILSON

*New Business Manager Southern Cities Distributing Company, Shreveport, La.**

ONE of the most successful means a utility company can adopt in merchandising is to assign a sales representative to a certain specific geographical territory. This territory should have from 1,000 to 1,500 customers, depending upon the buying power of these customers, percentage of saturation of appliances, etc. The man assigned to this territory should be capable of representing the utility company to its customers in every respect; in other words, he is the gas company to his customers, and is a powerful factor in good will building if he is the right sort of representative. By giving each man a special territory, this eliminates all of the men in the department over-working a certain portion of the city and neglecting other parts entirely. It seems to the writer that this is the only way we can thoroughly cover a territory.

It is our policy to have each man make a thorough canvass of his particular territory during January and February, weather permitting. The object of this canvass is to obtain a complete record of the number, condition, style, type, etc., of the various appliances in use in his territory and to locate prospects for additional new appliances and replacements. Then, when a campaign is held on any particular appliance, the representatives do not have to lose valuable time hunting up prospects for this appliance, but can call on those he has found to be in need of the appliance. His canvass book, which he must keep up to date, is a valuable record for himself and for the company in many ways. The data on these canvass sheets is transferred to a special card file which he is also required to keep up to date, and this file furnishes a very valuable list of data for any executive who might need it. A few samples of its use are:

As a prospect list for direct mailing campaigns.

As a source of information for any executive who needs to know the particular financial condition of any customer in any section of the city, percentage of saturation, etc.

In case a man has to be replaced on any particular territory, his successor can to some extent pick up where he left off and carry on much better than he could if this system were not in vogue.

We believe in the protected territory system. If a man has thoroughly canvassed his territory and has attempted to sell the utility company to each one of his customers, and some time later one of these customers comes into the utility office and buys some appliance, we feel that it was due in part, at least, to the efforts of the territory man, and that he should have credit accordingly. In this way all disagreements as to who should have credit for a sale are largely avoided.

Plan of Campaigns: In any campaign some particular reason has to be given a customer to induce him to make his purchase during the campaign instead of at some other time. After a thorough canvass has been made it is to the advantage of all concerned to divide the balance of the fiscal year into campaign periods. There are several reasons for this. It helps the department to sell a greater volume of merchandise than it would otherwise sell, and, since most sales departments' overhead expenses are a fixture, the net losses, if any, are less. The following list is suggested as a plan of campaigns for a fiscal year:

January and February, canvass the territories.

March, storage water heaters.

April, gas ranges.

May and June, gas refrigerators.

July, laundry equipment or storage water heaters.

August, general, no particular campaign.

September and October, house heating equipment.

the Year 'Round

Sales floor, and a recent window display—Southern Cities Distributing Co., Shreveport, La.

November, house heating equipment and water heaters.

December, Christmas Specials and stock reducing prior to final inventory.

Storage Water Heaters: It is our policy to give a $10 allowance for old water heating equipment on the purchase of storage heaters at all times. The allowance of course is taken into consideration when the price is set, but the psychology of this method is good and has proven itself well worth while time and again. Therefore, we must offer some additional reason for buying water heaters during campaigns. The following inducements have been tried with success:

1. An extra $10 allowance, making a $20 allowance for the old water heating equipment—*this sale only.*

2. A very small, or no, down payment—*for a limited time only.*

C. B. Wilson

3. Installation of the storage water heater on an approval, or trial, basis, no payment or order being required—merely the customer's verbal permission to allow the installation in his home. No definite trial period is recommended, but after a few days of satisfactory hot water service the representative should call on the user and either sell the heater or order it picked up and carried back to the warehouse. In one actual case where 100 people allowed these heaters to be installed, protesting that they would not and could not buy, 75 per cent bought and paid for the heaters.

Ranges: We regularly give a 10 per cent allowance on the price of a new range for the customer's old range. During a range campaign the following special sales points might be considered:

1. A featured model at a substantial price reduction—*this sale only.*

2. A range and set of dishes, or set of aluminum cooking utensils, or set of kitchen cutlery, or small kitchen radiant heater to set underneath the range to heat the kitchen, or other small room.

3. A small (95c) or no, down payment—*this sale only.*

4. A range and water heater combination, allowing a cash reduction on both if purchased and installed at the same time.

Gas Refrigerators: A 10 per cent down payment seems to be the usual procedure on time payments, with 18 to 24 months to pay the balance. Some of the suggested inducements might be listed as:

1. Twenty-four equal payments—1/24 down payments, with payments on the gas bill—*this sale only.*

2. The term price reduced to the cash price and further allowance for cash—*this sale only.*

3. An allowance for the old ice box on the purchase of a gas refrigerator. This can be worked out in many ways, i. e., by granting a special cash allowance on each particular model or allowing the salesman to use his own judgment and buy the old box as cheaply as he can, with a limit to how much he can allow for the old box.

4. A combination of all the above mentioned specials for a limited time only.

Laundry Equipment: This is a great fill-in for volume in off season months, and it increases the gas load by the additional use of hot water which is mostly heated by gas. One very successful method of selling laundry equipment is to have the territory representative demonstrate the machine at the customer's home, doing a complete washing and ironing. The equipment is either sold then and there or moved that afternoon to a new location. This will pre-

(Continued on Page 52)

* Presented at the First Southwest Natural Gas Sales Conference, held at Dallas, Texas, November 13-14, 1930

Pacific Coast Gas Association

Managing Director: Clifford Johnstone
Association Headquarters: 447 Sutter St., San Francisco
President: R. E. Fisher
Vice-President, Pacific Gas and Electric Co., San Francisco

"Data Book on Gas Fuel" Now Completed

THE Architects and Contractors Service Committee of the Commercial Section, under the leadership of Frank Moon of the Los Angeles Gas and Electric Corp., has completed in printed form a manual for architects, engineers, contractors and builders, which will be known as the "Data Book on Gas Fuel."

The book consists of 37 loose leaf sheets bound in an attractive file folder bearing the American Institute of Architects' File No. 29-F.

It contains brief, but complete data on house-piping, gas vents, flues, gas ranges, house-heating, refrigeration, laundry equipment and incinerators.

The manual has been in the course of preparation for some time; Mr. Moon was assisted by a capable committee and also by the constructive criticism of engineers and sales managers of the majority of the member companies.

In order that the book might be published in a form which would really appeal to architects, the committee engaged Albert John Evers, prominent San Francisco architect, to carefully review its work. Mr. Evers made many valuable suggestions regarding the form of the book and was so enthusiastic over its possibilities as an aid to architects that he permitted the committee to place his name on the title page.

Sample copies of the booklet have been mailed to the member companies of the Association soliciting orders for it.

When used by gas companies for distribution to architects the cover will be imprinted with the company name and sheets will be inserted giving specific information about the company's service.

Single copies of the book without the company imprint or special company sheets are on sale at the Association's office at $1.00 per copy.

P.C.G.A. Participates in Metal Congress

THE Pacific Coast Gas Association took an active part in the Western Metal Congress, held in San Francisco, February 16-20. The Industrial Sales Committee of the Commercial Section not only sponsored a technical program of papers on gas utilization subjects, but arranged an elaborate exhibition of burners and furnaces which was one of the principal features of the show. The gas exhibit occupied 2400 square feet of floor space, this space being purchased jointly by a number of gas companies and made available to manufacturers without charge. Gas companies contributing to the cost of the exhibition were:

The Pacific Gas and Electric Co.; Coast Counties Gas & Electric Co.; Southern California Gas Co.; Southern Counties Gas Co.; and Coast Industrial Gas Co.

The Pacific Coast Gas Association also bore a share of the expenses.

Some 50,000 people passed through the exhibit, and exhibitors report that results were beyond their expectations in prospects gained and sales made. F. C. Dietrich, industrial sales supervisor in San Francisco for the Pacific Gas and Electric Co., had direct charge of the gas exhibit.

The technical session sponsored by the Association took place at the St. Francis Hotel on February 19. Papers were read by James H. Knapp, president of Jas. H. Knapp Co., Los Angeles; E. G. De Coriolis, director of research, Surface Combustion Co., Toledo, Ohio; R. G. Guthrie, chief metallurgist, Peoples Gas Light & Coke Co., Chicago; and H. E. Passmore, operating engineer, National Tube Co., Pittsburgh, Pa. J. H. Gumz, industrial gas engineer of the Pacific Gas and Electric Co., arranged this program and acted as chairman of the meeting.

On February 18, the Industrial Sales Committee met in conference at the Palace Hotel. C. R. Miller of Portland, chairman of the committee, proposed a new plan of organization which in effect will include all Association members engaged in commercial or industrial utilization work in the committee's activities. This plan, in general, involves the continuous exchange of utilization data among engineers without regard to convention or mid-year conference dates. It was approved and a subcommittee appointed to put it into operation. L. C. Haffner of the Portland Gas & Coke Co., is chairman, assisted by Chas. Ferry, Southern Counties Gas Co., and J. H. Gumz, Pacific Gas and Electric Co. A noon luncheon was attended by 42 members of the committee and was addressed by R. E. Fisher, president of the Association; E. G. De Coriolis, director of research, Surface Combustion Co.; and J. Chas. Jordan, chairman of the Gas Industry Cooperative Advertising Committee.

Sections Planning March Conferences

MARCH will be a busy month for Association committee workers, as all sections will meet during the month. W. M. Henderson has called a Technical Conference for Los Angeles on March 5 and 6, and R. A. Hornby an Accounting Conference, also in Los Angeles, on March 13. Both sections will meet in the Los Angeles Gas & Electric Corp. building at 810 South Flower Street. Later in the month a joint meeting of the Commercial, Public Relations, and Publicity and Advertising Sections will be held in Los Angeles. At the time this is written no definite date had been chosen. This also applies to a Commercial Section meeting scheduled for Portland about the middle of March. Notices announcing the dates and programs for these latter meetings will be mailed to all interested members at least 10 days before they take place.

Arizona Meetings in April at Phoenix

J. S. Arnold, secretary of the Arizona Utilities Association, announces that the Annual Convention has been set for April 9-11 at the Arizona Biltmore, Phoenix. As usual the Pacific Coast Gas Association and Pacific Coast Electrical Association will be represented on the program.

Full Program for March 5-6 Technical Meetings

THE Technical Section of the Pacific Coast Gas Association meets in Los Angeles on Thursday and Friday March 5 and 6, 1931. All sessions will be held in the Assembly Room of the Los Angeles Gas and Electric Corp. Building, 810 South Flower Street.

The schedule provides for four sessions, each with a complete program. On Thursday morning the Distribution Committee—D. H. Perkins, chairman—will call for the progress reports from subcommittees. The various committees have been unusually active during the past few months, and three special reports on research problems will be presented.

Under the head of "Governor and Regulator Capacities," H. S. Harris, chairman of the committee on that subject, will present a report.

The Committee on Pipe Protection and Soil Corrosion—Guy Corfield, chairman—has a paper to be presented by O. L. Wrestler on the subject "Ground Moisture Survey of Distribution Areas."

The Distribution Design Committee will present a paper on "Recent Observasions on Diversity," by N. L. Hoff, chairman of the committee.

The Domestic Meter Committee has gathered some interesting data to submit as a special report on the subject, "The Economy of Leaving Locked Meters in Service," by H. M. Crawford.

All the reports and papers will be open for discussion. The meeting is open to all who desire to attend.

On Thursday afternoon a very unique program has been arranged. The subject "Pipe Joints" will be the only event. Illustrated talks on four accepted types of joints will be presented by representatives of the firms offering each particular joint:

"Electric Welding," as developed by the A. O. Smith Corp.

"Gas Welding," as now featured by the Linde Air Products Co.

"Dresser Couplings," by the S. R. Dresser Manufacturing Co.

"Victaulic Couplings," by the Victaulic Coupling Co.

Each joint has its champion, so the subject will be open for discussion after the presentation.

Friday morning the program will start with the reports of subcommittees functioning under the direction of the Natural Gas Transmission Committee—E. Henderson, chairman. Progress and special reports will be had from:

1. Compressor Station Committee—S. S. Donaldson, chairman.

W. M. Henderson

D. H. Perkins

N. H. Wardale

E. Henderson

2. Measurement Committee—A. R. Bailey, chairman.

3. Transmission Committee—C. W. Beck, chairman.

The Production Committee—N. H. Wardale, chairman, offers a report from the Fire Prevention and Housekeeping Committee, under the chairmanship of J. E. Kelley.

The morning program will be concluded with a report contributed jointly by the Distribution and Natural Gas Transmission Committees; the subject is:

"Reconditioning Pipe."

1. Transmission Lines—F. E. Jinnett.

2. Distribution Lines — R. C. Terradell.

The final session on Friday afternoon has but one number on the program. This will prove of interest not alone to technical men but to others as well. The subject is, "Modern Methods of Installing Large Diameter Pipelines." This is to be an illustrated talk followed by the showing of a moving picture taken during the construction of the Southern California Gas Co.'s 26-inch line over the Ridge. The preparation of this portion of the conference program has been under the direction of M. R. Thompson, vice-president of the Southern Counties Gas Co., assisted by R. Fuller, engineer distribution for the Pacific Gas and Electric Co., and Harry George, now chief engineer of the Southern Fuel Co. A general questioning and discussion on construction practice will conclude the meeting.

As considerable effort has been applied by the contributors to present worth-while reports, those who attend are assured a profitable two days.

Association Issues 1930 Statistics

STATISTICS collected by the Pacific Coast Gas Association reveal but little recession in gas company sales and revenues in 1930 as compared with 1929. The figures include the six Pacific Slope States and the Province of British Columbia. No exact comparison between the two years is possible, as the progressive introduction of natural gas of 1150 B.t.u. per cubic foot heat content in northern California cities during the spring and summer of 1930, to replace a manufactured gas of 550 B.t.u. per cubic foot, caused a sharp drop in gas sales as measured in cubic feet and a parallel decrease in revenue.

The economy of the natural gas has, however, tended to open up new markets, with the result that the sales in cubic feet for the Pacific Coast for 1930 are only 2.4 per cent under 1929. It is estimated that if it were possible to compute these sales in British thermal units, 1930 would show an increased business of about 5 per cent. Gross revenue decreased 3.6 per cent reflecting the tremendous rate reduction occasioned by the introduction of natural gas. New gas customers numbering 36,416 commenced service during the year, an increase of 2.3 per cent. Domestic gas users increased 2 per cent in number and industrial users about 12 per cent.

Some 1,680 miles of new gas mains were laid during the year, making a total of 24,018 miles of pipe line in the ground on December 31, 1930.

The gas company payrolls for the year totaled $20,838,390—an increase of nearly a half million dollars over 1929. Detailed figures are given in Table No. 1.

TABLE NO. 1. STATISTICS OF PACIFIC COAST GAS UTILITY OPERATIONS IN 1930 AS COMPARED WITH 1929
(Including California, Oregon, Washington, British Columbia, Idaho, Nevada and Arizona)

	Year 1929	Year 1930
Production—Mcf		
Water Gas	2,976,618	3,157,715
Coal Gas	1,765,372	1,691,301
Oil Gas	32,789,295	16,252,640
Coke Oven Gas	661,394	656,926
Natural Gas Purchased	111,487,959	126,566,082
Total	149,680,638	148,324,664
Customers Dec. 31		
Domestic	1,532,146	1,561,486
Commercial and Industrial	59,671	66,747
Total	1,591,817	1,628,233
Sales—Mcf		
Domestic	62,778,855	59,898,431
Commercial and Industrial	72,554,462	72,228,423
Total	135,333,317	132,126,854
Revenue		
Domestic	$60,483,390	$58,196,703
Commercial and Industrial	17,787,758	17,284,942
Total	$78,271,148	$75,481,645
Miles of Main Dec. 31	22,338	24,018
Number of Employees Dec. 31	12,770	11,605
Payroll—Year	$20,345,181	$20,838,390

Cooperative Advertising Committee Bulletins

The fruits of many months' work on the part of the members of the Cooperative Advertising Committee and those who have cooperated with them are revealed in the Bulletins mailed out from time to time to all members of the Association engaged in sales and advertising work. Recent bulletins have been accompanied by reprints of advertisements which will be carried in Sunset Magazine and in some 17 trade journals during the year. The Committee reports that the final radio broadcast of the 1930 series, sent out on February 4, resulted in the receipt of over 2,000 letters requesting a copy of the booklet, "Home Cookery with Gas."

3-Company Joint Advertising Program

(Continued from Page 27)

Blue Star Seal of the American Gas Association and the protection which this seal affords to purchasers of gas appliances.

Participation by the three companies in this advertising development has not resulted in any let-up in their individual advertising programs for their respective territories. In fact, two of the companies have appropriated increased funds for advertising in 1931.

A total of $117,040 has been provided for the joint campaign. This is budgeted as follows:

Newspaper (Commercial or Industrial)	$ 4,000.00
Newspaper Advertising (Domestic)	45,000.00
Outdoor or billboards	38,000.00
Four local magazines	3,540.00
Circulars	3,000.00
National Publications	11,000.00
Administration and Incidental Expense	12,500.00
	$117,040.00

The advertising directors of the three companies—Daniel L. Scott, of Los Angeles Gas and Electric Corp.; F. Harvey Holden, of Southern California Gas Co.; and Walter D Thurber of Southern Counties Gas Co. are in direct charge of the program. An assistant, John S. Spaulding, is employed to carry out the technique and the details developed by the committee. Headquarters for the preparation and distribution of the material issued by the committee have been established at 810 S. Flower Street, Los Angeles.

Opens New Huntington Park Office

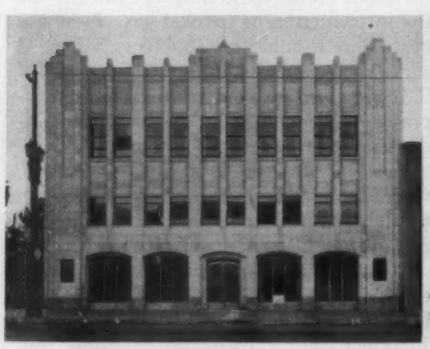
THE new Huntington Park district office of Los Angeles Gas and Electric Corp., located at 6426 Pacific Boulevard, was formally opened Saturday, January 24. The celebration, which took the form of an open house was held during the afternoon and evening, at which time residents and friends were given an opportunity to inspect the building. The office was opened for business Monday, January 26.

The new office, which represents a total investment of approximately $210,000 in land and building, is of Class "A" construction. The main building is two stories in height, with mezzanine and basement, and has an exterior finish of Indiana limestone. Its architectural design, both within and without, is of modernistic style.

The first floor contains the main business office and public lobby, and the mezzanine floor which overlooks it has an extensive display of modern heating, cooking and water heating appliances. The chief feature of the second floor is the auditorium which is equipped with a demonstration platform and model kitchen for holding cooking classes and other gatherings. An area 67 feet by 70 feet in the rear of the main building contains automobile sheds and quarters for the gas distribution activities.

J. C. Guilinger, who has been named district manager, has been with Los Angeles Gas and Electric Corp. for nearly 27 years. He went to Huntington Park in 1922 to open the company's branch there.

It is expected that the utility will handle more than 30,000 accounts through its new district office.



Exterior and interior views of L. A. G. and E. Corp.'s new Huntington Park office.

Officers for Pacific Service Employees Association for 1931

At a recent meeting of the Pacific Service Employees Association, employee organization of the Pacific Gas and Electric Co., San Francisco, the following officers were chosen to lead affairs of the Association for 1931: For president, W. F. Pape; vice-president, Grover S. Tracy; executive secretary and treasurer, J. C. Carmody.

Montesano Franchise to Gray-Tac

Gray-Tac Oil Co., operating in the Pacific Northwest, has secured a franchise for the service of natural gas in Montesano, Wash. Montesano is a town of about 2,500 population. The company is carrying on a drilling program in the area, and is headquartered at Aberdeen.

Applies to Serve in Baker, Ore.

Mountain States Oil & Gas Co., Weiser, Ida., has applied for a franchise for the service of natural gas in Baker, Ore. Franchise in the town is now held by the Eastern Oregon Light & Power Co., and expires in 1932.

Natural Gas in the 1931 Convention Hotel Headquarters

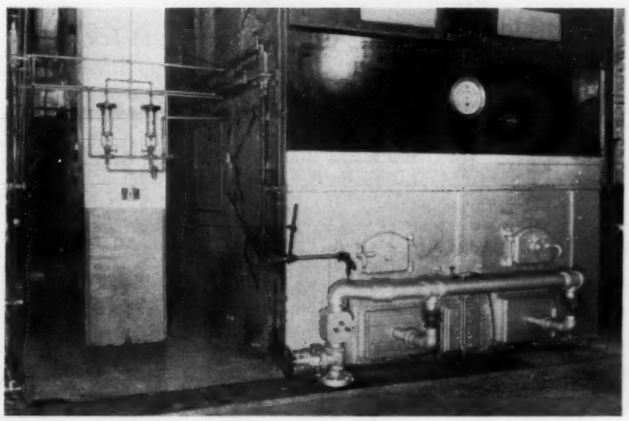
By L. H. HUNGATE, JR.

Industrial Engineer,
Memphis Power & Light Company

WITH A. G. A. Natural Gas Department convention dates only a little more than two months away—May 11-14—natural gas men from the four points of the compass will soon be converging on Memphis, Tenn.

Memphis is typical of the natural gas South, where domestic and industrial sales have been booming ever since the new fuel became available. Aggressive salesmanship is entrenching natural gas in southern territory.

One of the best customers on Memphis Power & Light Co.'s lines is the Peabody Hotel, which has been selected as Natural Gas Convention headquarters. Mr. Hungate's description of the Peabody Hotel gas installation will interest everyone who plans to be in Memphis during convention dates. —EDITOR.



Hotel Peabody, in Memphis, Tenn., where Natural Gas Department meets May 11-14. A portion of the hotel's modern gas-equipped boiler room is seen at the left.

NATURAL gas transported from the Monroe Fields by the Memphis Natural Gas Company and distributed in the city by Memphis Power & Light Company, has aided materially in making Hotel Peabody, "The South's Finest and one of America's Best"—an ultra-modern hostelry which, from basement to roof garden, is designed to give the guest a maximum of convenience and comfort.

L. H. Hungate, Jr.

The gas is supplied from the intermediate pressure system through a 6-inch service passing through a manifold of four meters before a regulator reduces the pressure to 1 pound. From the time it passes through this regulator until it joins the air as products of combustion, it is handled automatically.

Passing through a 6-inch header in a duct along the front of the three 268-h.p. boilers, it is ready to do the bidding of the automatic control, which gets its orders from the entire steam system. The steam pressure desired is 185 pounds gauge, and upon the slightest fluctuation in load the control functions smoothly and positively to place the pressure on this point. As the control goes into action, the damper in the breeching and the gas supply valve, being linked mechanically, operate simultaneously. This feature, with the combination of proper baffling and efficient burners, allows operation on the low furnace draft of .01 to .15 inches of water.

As the control is set to deliver 25, —100, — and 150 per cent boiler rating, with variation in the demand, and, as each step can be set to maintain the highest practical CO_2, it can easily be seen why the stack temperature rarely approaches 500°. This provides a temperature differential of approximately 125° F.

It is estimated that the annual gas consumption will be slightly in excess of 200 million cubic feet. This figure represents a tremendous amount of heat, so possibly a few remarks as to its uses might be appropriate. There are four steam systems to be supplied; the high, intermediate, secondary and low, carrying respectively 185, —100, —35, and 3 pounds gauge pressure.

Most of the steam generated by the boilers is used in heating the building, furnishing hot water, etc. The intermediate system, being supplied from the boilers through a pressure regulator, in turn supplies the laundry and boiler room auxiliaries. Also, through other regulators, it supplies the secondary system (comprised chiefly of the kitchen) and the low pressure system, if the quantity of exhaust steam is inadequate to maintain a pressure of 3 pounds. The five kitchens, of course, consume only a small percentage of the total amount of gas, but here again the clean, even heat contributes greatly to the standards maintained throughout.

All possible by-pass arrangements of meters and regulators have been provided, but to insure no interruptions there is a complete oil supply system with burners which can be placed in service almost instantly if it should become necessary.

The small pipe and fittings room was large enough for the gas meters, regulators and fuel oil pumping set, so that the coal bunkers were converted into a tool room and work shop—and still there was plenty of room for the pipe-racks and fittings.

We hope to be able to arrive at a conversion figure which will take into account all the factors chargeable to the use of a crude fuel such as soot-blowing, stoker-power, fan blast power, low and unsteady steam pressures, etc.

The Memphis Power & Light Co. is looking forward to the convention in May and finds satisfaction in the thought that Convention Headquarters is natural gas-equipped.

New Industrial Gas Rate For Edmonton Consumers

The Northwestern Utilities, Ltd., Edmonton, Alberta, proposes to introduce a new industrial gas schedule, which when placed in effect will give the consumer the following rates:

First	200 M.c.f.	31½c
Next	300 M.c.f.	25½c
Next	1000 M.c.f.	23c
Over	1500 M.c.f.	18c

The schedule now being followed is:

First	500 M.c.f.	33c
Next	1000 M.c.f.	28c
Over	1500 M.c.f.	23c

Oklahoma Utilities Ass'n. Annual Session

ARRANGEMENTS have been completed for the Thirteenth Annual Convention of the Oklahoma Utilities Association at Oklahoma City, March 10 and 11. Several hundred executives and employees of the gas, electric light and power, telephone, electric railway and manufacturing companies will attend this convention to be held at the Huckins Hotel.

Delegates at the convention will include about 200 representatives of natural gas companies operating principally in Oklahoma and adjoining states. Representing the gas industry on the program are: S. A. Lipscombe, Arkansas Natural Gas Corp., Little Rock; H. J. Hoover, Cincinnati, Ohio, editor, Natural Gas; H. A. Atwater, Combustion Equipment Co., Kansas City, Mo.; O. M. Setrum, Detroit, Mich., manager of the Philfuels Co.; J. F. Orr, commercial manager, United Gas System, Houston, Texas; and E. C. Cortelyou, Cities Service Gas Co., Bartlesville, Okla. Leading representatives of the electric light and power industry will include W. A. Jones, New York, president National Electric Light Association; J. F. Owens, Oklahoma City, vice-presdient of the same organization, and V. J. Graham, Dallas, Texas, Edison Lamp Works.

J. W. Duvall as chairman of the Gas Division will preside at sessions of that division.

At the General Session on Tuesday, March 10, an address will be given by J. F. Orr of Houston, Texas, commercial manager of the United Gas System.

Following is the tentative program for the gas division:

TUESDAY AFTERNOON, MARCH 10

Presiding—J. W. Duvall, Division Chairman.

"Southwestern Gas Measurement Short Course"; C. B. Day, Blackwell, Okla., chairman, General Committee

"Natural Gas Progress in 1930"; H. J. Hoover, Cincinnati, Ohio, editor, Natural Gas.

"Accident Prevention in the Gas Industry" (illustrated); A. W. Breeland, Dallas, Texas, safety supervisor, Lone Star Gas Co.

"New Methods of Determining Open Flow Capacities of Gas Wells"; E. C. Cortelyou, Bartlesville, Okla., production department, Cities Service Gas Co.

J. W. Duvall (Below) Chairman, Gas Division

E. F. McKay Manager, Oklahoma Utilities Ass'n.

WEDNESDAY MORNING, MARCH 11

"The Gas Engine in Industry"; A. J. Schlosser, Tulsa, Okla., general superintendent, Gasoline Department, Barnsdall Oil Co.

"Organizing for Effective Appliance Installations and Services"; S. A. Lipscombe, Little Rock, Ark., new business manager, Arkansas Division, Arkansas Natural Gas Corp.

Motion Picture: "Carbon Monoxide, the Unseen Danger."

"Carbon Monoxide Poisoning"; G. T. Donceel, Oklahoma City, industrial sales department, Oklahoma Natural Gas Corp.

"Good Practice in Utilization of Fuels"; H. A. Atwater, Kansas City, Mo., chief engineer, Combustion Equipment Co.

WEDNESDAY AFTERNOON, MARCH 11

"Utilization of Liquefied Petroleum Gases by the Utilities"; O. M. Setrum, Detroit, Mich., manager, Philfuels Company.

"Analyzing and Securing the Most Profitable Load"; James F. Orr, Houston, Texas, commercial manager, United Gas System.

Motion Picture: "Building an Empire"; presented by George H. Baird, Bartlesville, Okla., general superintendent, Cities Service Gas Co.

Wyoming-Nebraska Line Plans Form

FEBRUARY marked definite progress on plans of the North Central Gas Co. of Casper for construction of a natural gas transmission line from gas fields in central Wyoming to serve cities and towns in eastern Wyoming and western Nebraska, permission for laying the line have been granted by the Wyoming Utilities Commission.

A survey of the route is now complete, and the line as planned will have its source in the Muskrat fields about 75 miles west of Casper, Wyo. Connection will also be made with the company's trunk line from Sand Draw to Casper. It is believed that these two fields will furnish an adequate supply for the entire system.

The first 227 miles will consist of 14-inch pipe, and with the exception of 10 miles of 12-inch, the balance of the line will be 8-inch. Between Wendover and Guernsey a lateral will extend to Laramie, consisting of 78 miles of 10-inch. There will be two compressor stations, one at Casper and one near Guernsey.

Bids were taken on construction of the line in February, with the contract scheduled to be let late in February or early in March.

The eastern terminus of the line will be at Bridgeport, Neb. En route to this city the line will serve Douglas, Orin Junction, Glendo, Wheatland, Torrington, Wendover, Guernsey, Fort Laramie, and Laramie, Wyo., and Henry, Lyman Morrill Mitchell, Scottsbluff, Gering, Minatare, and Bayard, Neb. The Citizens Gas Co. at Scottsbluff, Neb., was recently purchased by the North Central Gas Co.

North Central Gas Co. is a subsidiary of New York Oil Co., which in turn is a subsidiary of the Northern Utilities Co., Chicago, Ill., of which Charles A. Munroe is president.

Changes in Company Personnel Announced by United

Announcement has been made of several changes in the personnel of the United Gas System subsidiaries, brought about by additions of properties and new developments throughout the system. W. W. Stein has been placed in charge of the Mississippi division of the pipe line department, with headquarters at Jackson, Miss. His place as manager of the Laredo, Texas, district, has been taken by S. L. Robertson. D. S. McManus has been named manager of the distribution department of the Louisiana division, with headquarters at Lake Charles, La. C. A. McDowell has been named production superintendent at the Beeville, Texas, division headquarters.

Southern Fuel Going Ahead With Kettleman-L. A. Line

Contract on the Southern Fuel Co.'s 210-mile line from Kettleman Hills field to Los Angeles and Long Beach, Calif., will be let April 1, according to Harrison P. George, chief engineer of the company.

On February 7, five cars of 26-inch pipe were delivered for use on a 3-mile stretch of right of way which the company is constructing in advance of the main line in order to get it in ahead of a paving job. Construction of this unit is expected to be complete early in March. A survey is now being run on the main line, and rights-of-way are being secured.

Southern Fuel Co. headquarters in the Garland Building, 740 S. Broadway, Los Angeles.

Report Kentucky Gas for Detroit in 1931

According to late reports from the press, the American Light and Traction Co., through its subsidiary the Detroit City Gas Co., is planning the distribution of natural gas in Detroit, Mich., the gas to be brought to the city by means of a pipe line to be constructed by Moody-Seagraves interests from Ashland, Ky. The line to be constructed in 1931 would be approximately 400 miles long and would cost $25,000,000, according to the report.

Wichison Gas Co. Gets Permit to Serve Domestic Customers

A Supreme Court decision was handed down early in February in Wichita, Kan., giving the Wichison Gas Co. of that city permission to serve gas for domestic and commercial use in Wichita. The company has been serving gas for industrial purposes since the granting of its original franchise. The Wichison Gas Co. is affiliated with the Consolidated Gas Utilities Co., Oklahoma City, Okla.

Asks Minneola Franchise

A franchise is being asked by the Central States Gas Utilities Co., subsidiary of the Panhandle Eastern Pipe Line Co., Kansas City, Mo., asking permission to serve natural gas in Minneola, Kan.

Greenfield Plans for Gas Service

Greenfield, Iowa, has granted a franchise for the service of natural gas in that town to the Central States Electric Co.

Distribution Conference in Session April 8, 9, and 10

The Eighth Annual Distribution Conference of the Technical Section of the American Gas Association will be held April 8, 9, and 10, at the St. Nicholas Plaza Hotel, Cincinnati, Ohio.

It is planned to hold six sessions, two on each of the convention days, one of the sessions being held at night to permit sightseeing during the afternoon. The night session is a new feature of the conference.

The Union Gas and Electric Co., Cincinnati, is arranging entertainment details.

Papers and reports called for on the program will feature distribution of natural gas, leakage, oil fogging, corrosion and other related subjects.

The Pipe Joints Committee of the Technical Section will have a report to make, as will also the Cast Iron Pipe Standards Committee and the Meters Committee.

Lattner to Offer New Line of Gas Fired Boilers

The P. M. Lattner Manufacturing Co., Cedar Rapids, Iowa, will shortly announce a new line of gas fired high pressure, 100-pound boilers. These new boilers are said by the manufacturers to be built on an entirely new principle of boiler construction, and will present a departure from the commonly known methods of obtaining heating surface in boilers.

This new boiler will have no tubes or coils.

The company has had this new type of boiler on test for two years. Machinery is now being placed in the Cedar Rapids, Iowa, factory and production on the new boiler should start within 60 days.

Mason City Line Completion Scheduled for April 1

Completion of Northern Natural Gas Co.'s line from Des Moines, Iowa, to Mason City, is expected by April 1. The line is of 20-inch pipe, and is an extension of the company's major carrier from the Texas Panhandle to metropolitan centers in Nebraska and Iowa. Some 30 towns are already being served from the main line, including Council Bluffs, Iowa. The company has completed 917 miles of line during the past nine months, including the 24-inch main line from Texas fields to a point near Omaha, Neb., and extensions from this line.

West Virginia Asks City To Extend Gas Mains

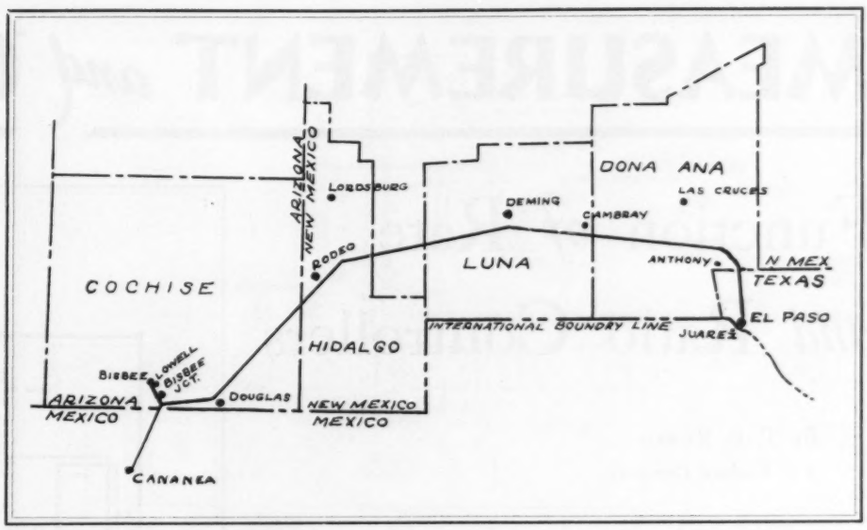
A petition signed by citizens of West Virginia, Minn., has been handed to the city council of Virginia, asking that the gas mains be extended from Virginia to serve the suburb of West Virginia. The gas plant and distribution system is municipally owned.

Greensburg, Kan., Now Being Served With "Natural"

Public Service Co. of Kansas recently completed a 3-inch extension to serve Greensburg, Kan. This town is served by the Peoples Gas Co., Tulsa, Okla.

New Bremerton, Wash., Office

The Western Gas Co., of Washington, is in new Bremerton headquarters at 609 Fourth St.



Construction Begun on Arizona Line

ACTUAL construction of the Western Gas Co.'s line that will carry natural gas to Arizona mining centers was begun around the middle of February with completion dates set for the summer months. The line will be an extension of the El Paso Natural Gas Co.'s line originating in the Lea County, N. Mex., gas fields. Paul Kayser is president of both companies, which are controlled by Natural Gas Securties Corp. Engineers Public Service Corp., subsidiary to Stone & Webster, acquired a three-year option to purchase control of the stock of the El Paso Natural Gas Co. This company will also supervise construction of the line.

The course of the carrier will be from El Paso to a point near Deming, New Mexico, and thence to Douglas, Arizona. Branch lines will be extended from Douglas to Naco and Bisbee, Arizona, and to Cananea, Mexico. The main line will be approximately 235 miles in length and will be made up of 12-inch pipe, with the exception of approximately 7½ miles of 16-inch pipe that will extend from El Paso to the location of the first compressor station. The branch lines, approximating 75 miles, will be of 10-inch pipe.

Ford, Bacon & Davis has the general contract on the line with Bechtel & Kayser of San Francisco being awarded the contract for the construction. Stone & Webster, largely interested financially in the line, will have charge of the construction of the compressor plants, four in number, which will go into the project. Two of these plants will go into the new extension of the line with two stations being constructed on the original 200-mile line from Lea county to El Paso. Until this date the El Paso line has operated on natural rock pressure.

An order for 11 twin tandem double acting direct connected 800-horsepower gas engine compressors, each capable of handling 21,000,000 cubic feet of natural gas daily, has been received by The Cooper-Bessemer Corp. from the Western Gas Co., according to B. B. Williams, president of the engine company. The total consideration was placed at $375,000.

Five of the engines will be used on the new extension. One battery of three units will be placed on the present line near Fort Bliss, Texas, and another group of like power will be installed north of Sieria Blanca, Texas.

On the new line, the engines will be placed at El Paso and Lordsburg, N. M.

A. O. Smith Corp. will supply the pipe for the main line from El Paso to Douglas, with Republic Steel Corp. being awarded the contract for the branch line. The first delivery of pipe was made on February 12 by A. O. Smith Corp. The main line will be welded in the field and will be of double-belled pipe.

The mining interests to receive the gas are the Phelps-Dodge Corp., the Calumet and Arizona Copper Co. and the Greene-Cananea Copper Co., a division of the Anaconda Copper Co. It is understood that 15-year contracts have been signed by these companies for their entire fuel requirements.

L. S. Davies Superintending Kent Extension

L. S. Davies of Chicago, Ill., has been appointed by the Seattle Gas Co., Seattle, Wash., as superintendent of the extension to Kent, Wash.

Standard Gas and Electric Co. Earnings for 1930

John J. O'Brien, president, Standard Gas and Electric Co., headquartered at Chicago, Ill., announces that preliminary consolidated earnings of the company and its subsidiary and affiliated companies for the year ended December 31, 1930, show a balance of $13,078,681 after all charges including retirement reserve and preferred dividends, compared with a balance for the 12 months ended December 31, 1929, of $10,298,053, an increase of $2,780,628.

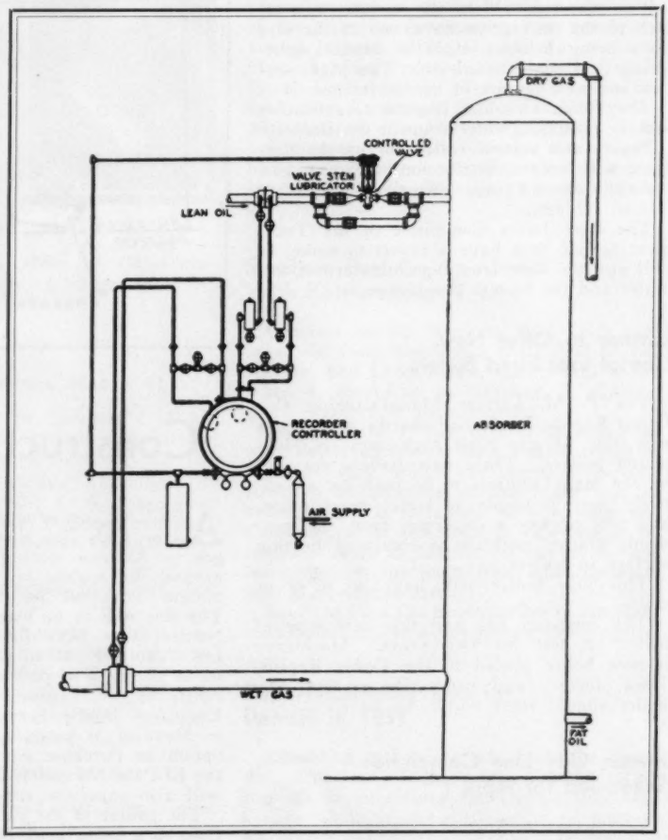
New Office at Iowa Park

Municipal Gas Co., Iowa Park, Texas, has opened a new office in First National Bank Building, with Ismael Corder in charge.

MEASUREMENT *and* CONTROL

Function *of* Rate *and* Ratio Controllers

By T. B. BURRIS
The Foxboro Company



AT RIGHT:

Ratio flow recorder - controller, adaptable to oil - absorption process in natural gasoline manufacture

THE idea of measuring and controlling automatically the flow of a gas or liquid was developed and found practical about six years ago.

The most common application in those days was that of volume control on air-gas lift. The Seminole field in Oklahoma was producing $2.00 oil and there followed frenzied efforts of drilling to the pay. When a well came in no time was lost in applying gas lift to pull the well for every available barrel contained in the sand. This procedure soon brought reverses, in that high percentages of water and rotary mud were found in the oil.

As they approached the water and rotary mud stage hand control became quite difficult, as the flowing pressures would vary with water heads, volumes would approach an intermittent tendency, consequently one or more wells would die. With hand control the man in the central station was hopping around like a board marker in a stock exchange office, trying to regulate valves.

The volume or flow controller helped the operator considerably in that the controller handled well heading in such a manner that none of the wells died, if the volume rate was set to compensate for water heading. Wells that were flowing 100 per cent oil and gas were assured of uniform input volumes which made it possible for the production engineer to really obtain some reliable data about oil-gas ratios. In the event of line breakage the controllers would shut off, thereby eliminating the hazard of losing other wells.

A volume or flow controller is an orifice meter with the mechanics of control principle applied to it. The control proper is powered by air or gas pressure, which is utilized in such a manner that the movement of the differential pen regulates the bleeding of air from a nozzle. This action affects a control or relay head which supplies or decreases air pressure to a diaphragm operated control valve. The action of the control valve installed in the line proper increases or decreases the medium to be controlled. The differential setting or volume limit is held constant by the control valve, irrespective of line pressure changes. The instrument controls differential; pressure variables or constants are a function of the process and are not controllable by an instrument of this type.

Since the Seminole days, flow control has branched off into many important applications in the oil and gas industry. It has been found that the control of flows brings about uniform conditions in almost any process where flow is the base of the process, and makes other forms of control such as pressure and temperature, much easier to effect.

An example of the above might be quoted. In the process of rectification in natural gasoline manufacture, the rate of flow is the base of the process. If the rate is erratic, temperature, pressure and the product cannot very well be uniform. It is the writer's idea that flow control is the prime factor which should be considered in a process of this nature. Automatically controlling the raw feed and reflux by means of a rate of flow controller permits temperature to do a more uniform

*Presented before the Southern California Meter Association, February 26, 1931.

February 26 S.C.M.A. Session *at* Los Angeles

MEETING again in the Los Angeles Gas and Electric Corp. Auditorium, the Southern California Meter Association on February 26 held its monthly gathering, with two papers comprising the program.

"Measurement of Non-Viscous Liquids" was the title of a paper by W. L. Cowan of the Union Oil Co. Mr. Cowan's able presentation will be published in an early issue. The second paper was on the subject of "Rate and Ratio Controllers", given by T. B. Burris of The Foxboro Co., and published in this issue. Both papers were illustrated by slides.

Twelve new active members and one associate member were taken into the Association, as announced at the February meeting by F. E. Bradley, chairman of the membership committee.

The S.C.M.A.-*Western Gas* Good-Fellowship Trophy, which has been contested for in 12 golf tournaments held over the past year and a half, was awarded at the February 26 meeting to H. G. Andrews, following his victory at the Association's Jubilee Tournament, January 18. Mr. Andrews will hold the cup permanently. Another "S.C.M.A.-*Western Gas* Good-Fellowship Trophy" was placed in competition at the monthly tournament held March 1 at the Long Beach Country Club.

The Association's next meeting will fall on Friday, March 20, the place being the Oil Equipment and Engineering Exposition, at Compton, California.

job of fractionation, because it has the same uniform rate of charge to handle at all times. In this event temperature control is a much easier task. With the temperature well in hand, the vent gas released by the pressure controller should approach a state of uniformity. Hence, the smoothness of non-erratic operation may be credited to the control of the base of the process, or controlling the process in the initial stage. The control of any basic medium in any process, if applied at the initial stage, will without question stabilize uniformity for reactions taking place throughout the system. An old medical proverb states, "An ounce of prevention is worth a pound of cure." A cure at the tail end of any process is hard to attain without the ounce of prevention at the initial end.

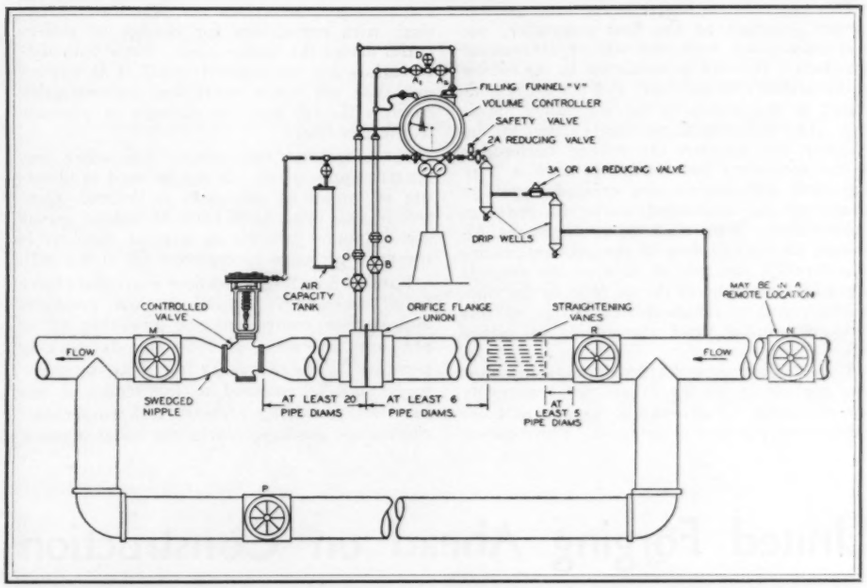
Another member of the flow control family which becomes erratic at times is that of oil sand repressuring.

Repressuring or rejuvenation is the injection of air or gas to a closed in well. The results are found in the wells surrounding the injection or key well.

The success of such a process is, of course, a close study of well logs, choosing a suitable well for injection, and the injection of a uniform rate to the key well.

It is often the case that a good producer is chosen for a key well. Good and bad oil wells cost money. A good well chosen for injection purposes will still be a good well if properly handled. It can be ruined with improper injection rates. A flow controller applied to the key well assures uniform volume rate to the oil sand. If the initial rate is too high there is a hazard of sand channeling or blowing through to some neighboring well. In this event the volume controller immediately decreases the volume, thereby saving a larger sand rupture. Furthermore, the controller gives the operator a full picture of sand reactions in conjunction with meters placed on nearby wells, which tell the story of repressuring results.

If the supply pressures to the key well are quite variable, or if the key well is rather reluctant about taking its medicine, the volume control plays the important role of controlling and recording a constant volume.



Rate of flow controller applicable to air-gas lift or repressuring

Injection volumes varying from day to day make the task of the engineer in charge more arduous, in that the sand reactions are difficult to interpret.

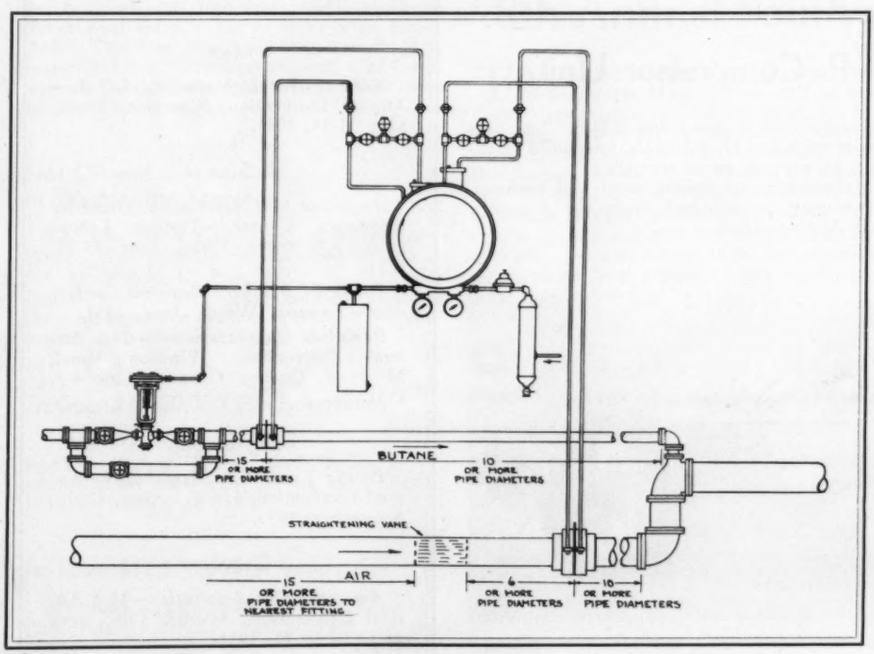
We often find applications for key wells which are situated in some instances several miles from any central point, and the well in question is not visited for several days. The volume controller using a seven day chart is installed at the well. Let us assume the gas supply comes from the residue system of a gasoline plant. Due to the decreased volume of wet gas to the plant at night, especially on a cold night, there is in turn a decrease in residue supply. The remote key well which we have in mind begins to fall off on volume injection. The controller in turn opens the controlled valve, endeavoring to pass the amount required by the control point. In the morning and during the following day, the residue supply has perhaps increased 4 or 5 times the amount needed at the well, but the controller throttles the valve to maintain the volume no higher than the setting of the control point.

If this application were to be solved by hand control, the hand operator would have to be pinching the valve during the day and opening up at night; ultimately, the well might either channel or never get enough volume to show appreciable results. In either event it is time and labor lost, with perhaps several good wells thrown in for a bargain.

As time progresses, users of automatic controllers are finding new applications in which they desire automatic control. Operating efficiency is not attained by manually operating numerous hand valves, because of excessive labor costs. Automatic control is cheaper than manual control, in that one man can easily watch any number of controllers, but he cannot watch and regulate hand valves.

For instance, a hand operator in a refinery or gasoline plant with some ratio controlling to do along with his other tasks faces a difficult task. To cope with problems of this nature a ratio controller has been devised which will record, measure and control one medium in a constant ratio to another medium. This type of controller really consists of two recording differential type meters acting as one. If the differential of one moves the slightest, the other follows, making a proportionate move, which is always in direct ratio to the other.

For the moment let us consider an application where a constant ratio between a primary and secondary medium is desired. An oil absorption process for natural gasoline manufacture has a common application for ratio control, namely, that of controlling the oil-gas ratio during the absorption process. It is obvious of course in the absorption process, that the oil will pick up the most desirable gasoline vapors as the gas passes through it. If the rates of oil and gas passing through the tower are constant, a fixed percentage of enriched oil saturation is founded, which is a resultant of so many gallons of lean oil circulated per 1000 cubic feet of rich gas.


BUTANE
15 OR MORE PIPE DIAMETERS
10 OR MORE PIPE DIAMETERS
STRAIGHTENING VANE
AIR
15 OR MORE PIPE DIAMETERS TO NEAREST FITTING
6 OR MORE PIPE DIAMETERS
10 OR MORE PIPE DIAMETERS

Air-butane ratio controller

This controller is based on the same fundamental principle as the flow controller, but it is constructed with two sets of differential chambers. One set is connected to the orifice in the primary or gas line, and the other connected to the orifice in the secondary or oil line. The differential pressure created by the primary line operates the setting mechanism of the secondary instrument in such a way that both differentials are created equal by means of the controlled valve in the secondary line. With such an arrangement, although the rate of flow of the primary varies considerably, the rate of flow of the secondary will always be in direct ratio to the flow of the primary, the numerical value of this ratio depending upon the choice of orifice size.

Unless there is a decided change in gasoline content of the gas, there is no necessity for changing oil-gas ratios, except to compensate for changes in pressure. Flow curves for pressure corrections are practically identical with corrections for change of differential across the orifice plate. Since both differentials are maintained equal it is apparent that the ratio controller automatically corrects the oil flow for changes in pressure in the gas line.

A control of this nature has other important applications. It can be used in blending of liquids or gas, such as butane. Control in this instance is ratio of butane versus air. Another process in natural gasoline is the ratio of steam to enriched oil to the still.

Rate of flow and ratio flow controllers have been successfully applied on low pressures and similar controllers are available up to pressures in excess of 3500 pounds working pressure. The accuracy of their measurement may be confined to five-tenths of one per cent, providing pressure and temperature corrections are supplied in the usual manner.

United Forging Ahead on Construction

UNITED Gas Public Service Co., operating unit for the United Gas System, is working ahead on its several projects in Texas, Louisiana, and Mississippi. The line from Boggy Creek field to Huntsville and Crockett was announced as completed late in February, with an extension projected from Huntsville, to serve Conroe, approximately 20 miles distant. The extension from the San Antonio-Austin line, serving Elgin, Butler, Bastrop, Smithville, Giddings, La Grange, Weimer, and Hallettsville, was reported 85 per cent complete during the month.

The 158-mile pipe line from Kirbyville, Texas, to Franklin, La., serving two score of towns in Louisiana, is well under way, work progressing as fast as weather and terrain will permit. This extension is being constructed of 14- and 12-inch pipe, with laterals of 8-inch. A second Louisiana development is the projected line from the Terebonne field to serve Morgan City, Thibodaux and Houma.

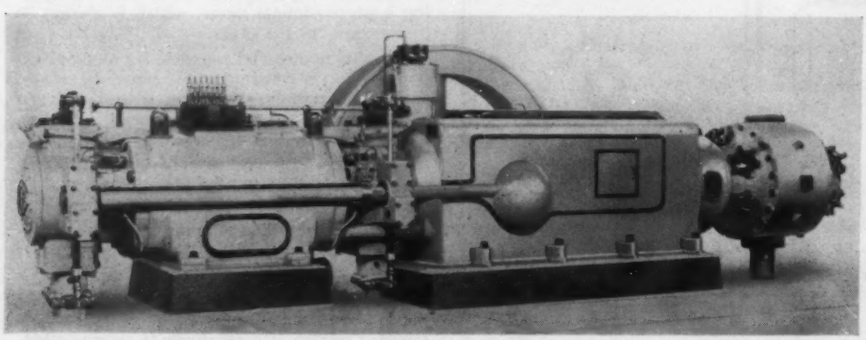
Following purchase by the United Pipe Line Corp. of lines extending from Jackson, Miss., through Mobile, Ala., to Pensacola, Fla., from the Southern Natural Gas Corp., a line was projected to take natural gas from the Bogalusa extension of this carrier to St. Joe, Slidell, Covington, Hammond, Ponchatoula, Amite, Kentwood, Fulker, Rosedale and Tangipahoa. Louisiana Power & Light Co., New Orleans, is applying for franchises for the service of natural gas in several of these towns.

Another extension from Jackson, Miss., to serve Terry, Crystal Springs, Gillman, Hazelhurst, Beauregard, Wesson, Brookhaven, Bogue Chitto, Summit, Fernwood, Mississippi, and others. W. W. Stein, formerly manager of the Laredo division distribution department, is in charge of the Jackson-Fernwood development, with offices at Jackson, Miss.

Cooper-Bessemer 400-H. P. Compressor Unit

THE new Type 40 four-cycle compressor unit recently announced by the Cooper-Bessemer Corp., Mt. Vernon, Ohio, delivers 400 brake horsepower in about the same space usually required for 200 B.H.P., according to the manufacturer. The single-cylinder unit is rated 200 B.H.P. The new twin units are of unusually low build, making all moving parts accessible.

Information on specifications and performance may be obtained from the company, Mt. Vernon, Ohio.



New Type-40 Cooper-Bessemer Compressor.

1931 Calendar

March

P.C.G.A. Technical Section Conference—Los Angeles, March 5-6, 1931.

Oklahoma Utilities Association—Annual Convention, Oklahoma City, March 10-11, 1931.

Illinois Gas Association—Annual Convention, March 12, 1931.

Pacific Coast Gas Association Accounting Section Conference—Los Angeles, Calif., March 13-14, 1931.

Second Annual Oil Equipment and Engineering Exposition—Los Angeles, March 16-22, 1931.

Southern California Meter Association—Los Angeles, Calif., March 20, 1931.

American Chemical Society, Gas and Fuel Division—Indianapolis, Ind., March 30-April 3, 1931.

April

P.C.G.A., Joint Conference, Commercial, Public Relations and Publicity and Advertising Sections—Los Angeles, Calif., March, 1931.

American Gas Association Distribution Conference—St. Nicholas Plaza Hotel, Cincinnati, Ohio, April 8-10, 1931.

Mid-West Gas Association—Annual Convention, Dubuque, Iowa, April 13-15, 1931.

Annual Southwestern Gas Measurement Short Course—Norman, Okla., April 21-23, 1931.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 16-18, 1931.

Arizona Utilities Association (jointly with P.C.G.A. and P.C.E.A.)—Annual Convention, April 9-11, 1931.

American Gas Association Accounting Conference—Chicago, Ill., April 23-24, 1931.

May

Natural Gas Department, A.G.A.—Annual Convention, Memphis, Tenn., May 11-14, 1931.

June

American Gas Association, Domestic Appliance Course—Testing Laboratory, Cleveland, Ohio, June 15-20, 1931.

P.C.G.A., Northern Regional Conference—Tacoma, Wash., June, 1931.

Canadian Gas Association—24th Annual Convention, Windsor Hotel, Montreal, Quebec, Canada, June 4-5, 1931.

September

Pacific Coast Gas Association—Annual Convention, San Francisco, Calif., September, 1931.

October

American Gas Association—13th Annual Convention, Atlantic City, week of October 12, 1931.

Working Ahead on Projects to Serve More Colo. Towns

Warm weather prevailing throughout Colorado has enabled Public Service Co. of Colorado, Denver, to begin building distribution systems in new communities much earlier than the work was scheduled.

At Aurora, suburb of Denver on the east; at Brighton and at Longmont, Colo., where franchises were recently granted, Public Service Company began trenching operations early in February. The Aurora job will be hooked directly to the Interstate Gas Co.'s pipeline which runs along the outskirts of the town. About a mile of extension on the part of Colorado-Wyoming Gas Co. will be necessary at Longmont; and Colorado-Wyoming will contract for a 12-mile extension to connect with Brighton.

Spencer Thermostat Merges With General Plate

Announcement was made on February 1 of the consolidation of the Spencer Thermostat Co., Cambridge, Mass., and the General Plate Co., Attleboro, Mass., under the name of Metals and Controls Corp. The identity and personnel of each organization will remain unchanged.

The new address of Spencer Thermostat Co. is 34 Forest St., Attleboro, Mass.

Asks to Exercise Franchise Rights in Kettleman City

West Side Natural Gas Co., Taft, Calif., has applied to the California Railroad Commission for a certificate of public convenience and necessity to exercise franchise rights granted by Kings County for the service of natural gas in Kettleman City, and to serve gas in Avenal, Calif.

To Build 6-Inch Transmission Line to Pine Bluff

According to recent word from the Arkansas press, arrangements have been completed for a 6-inch gas line from the Mississippi River Fuel Corp.'s line to serve Pine Bluff, Ark. The line would be constructed at a cost of $25,000. Arkansas Natural Gas Corp. now serves the town from an extension from its Little Rock carrier.

Ives Oil and Gas to Drill in Washington Territory

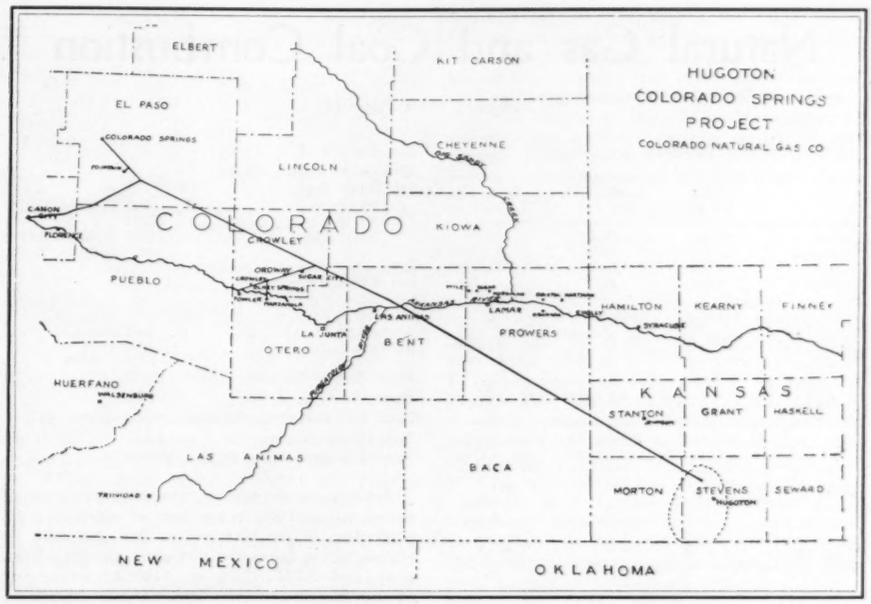
The Ives Oil & Gas Corp., of Bellingham, Wash., was recently incorporated at $250,000 by Waldo C. Ives, D. J. S. McBride, and Samuel Orloff. The company plans to carry on extensive drilling operations for natural gas in Washington.

To Spend $500,000 For Extensions

Public Service Co., of Colorado, headquartered at Denver, has set aside $500,000 for extension of gas service in its area during 1931.

To Issue $12,500,000 in Bonds

Approval was given on February 17 by the California Railroad Commission to the Southern California Gas Co. to issue $12,500,000 in first mortgage, 30-year bonds.



Prepare for Colorado Springs Line

WITH plans calling for completion of a line to Colorado Springs, Colo., by late summer or early fall, the Colorado Natural Gas Co. is making preparations for beginning construction on the carrier with the coming of Spring.

The line as surveyed will take it from Hugoton fields in Stevens County, Kan., through Prowers, Bent, Otero, Crowley, Pueblo and El Paso Counties, in Colorado, with one lateral serving Sugar City, Ordway, Crowley, Olney Springs, Fowler and Manzanola, while another will take gas to Canon City and Florence.

A short lateral will serve Fountain.

Colorado Natural Gas Co., headquartered at Colorado Springs, of which Arthur K. Lee is president, and H. A. Galligan general manager, has purchased the Canon City Gas Co., serving manufactured gas in that town, and has been granted a franchise in Fountain. Franchises had previously been granted in the towns on the Ordway-Fowler extension.

E. G. Jones, manager of the Canon City Gas Co., will remain in that capacity under the new ownership.

8th Annual Southwestern Meter Course

THE eighth annual Southwestern Gas Measurement Short Course will be held under supervision of the College of Engineering, University of Oklahoma, Norman, April 21, 22, and 23. The Oklahoma Utilities Association and the Oklahoma Corporation Commission also cooperate with the university in putting on this short course. The course offers instruction and practical demonstrations in connection with the reading, maintenance, and repair of gas meters and other gas measuring equipment.

Manufacturers of gas measuring equipment will hold exhibits in connection with the school and will also participate in the program. Professor W. H. Carson of the university faculty is director of the course and instructors in the School of Engineering and experts from the gas companies and gas equipment concerns conduct the classes and demonstrations.

Twenty-two states were represented in the registration last year with two men from foreign countries.

Firth Manager of Sales for Standard Management

J. K. Firth, Jr., formerly head of the Fuel Oil and Asphalt Division of the Standard Oil Co. of California, has recently been appointed manager of sales for Standard Management and Operating Corp., San Francisco, Calif., placing him in charge of sales of the Pacific Public Service properties, including the Coast Counties Gas and Electric Co., West Side Natural Gas Co., Coast Industrial Gas Co., and Natural Gas Corporation of California, Natural Gas Corporation of Oregon, and Natural Gas Corporation of Washington. The sales managements of the individual subsidiaries remain unchanged, each operating under the same executives as heretofore.

New Distribution System at Bisbee

Arizona Edison Co., Phoenix, Ariz., is laying a new gas distribution system at Bisbee, Ariz., preparatory to the coming of natural gas. The company maintains a manufactured gas plant in the city.

Natural Gas and Coal Combustion

(Continued from Page 34)

by the Dulong formula, as follows:

	B.t.u. Per Lb.	Combustible Per Lb.	B.t.u. Per Lb. of Coal
Carbon	14,600	.754	11,008
Hydrogen	62,000	.050	3,100
Oxygen	−7,750	.062	−481
Sulphur	4,050	.007	28
Total Heating Value Dry Basis			13,655
Total Heating Value with 5% Moisture			12,972

Gas Analysis at 30 in.—60° F.

	B.t.u. Per Cu. Ft. Higher Value	B.t.u. Per Cu. Ft. of Gas
Methane 90%	1,016	914.4
Ethane 5%	1,781	89.0
Nitrogen 5%	0	0.0
Total Heating Value at 30"-60°F		1,003.4

Total Heating Value at 14.9 lbs. 60°F

14.693
14.9x1003.4 equals 1,017.0

Coal Combustion

The products of combustion per pound of coal as fired for the above coal are computed as follows:

No Excess Air

Carbon to Carbon Dioxide	Pounds
.7163 lbs. x 3.667 lbs.	2.627 Carbon Dioxide
.7163 lbs. x 2.668 x 3.32	6.341 Nitrogen
Hydrogen to Water Vapor (by combining with outside air)	
(.0475 - .0589) x 9 / 8	0.361 Water Vapor
.0401 x 8 x 3.32	1.065 Nitrogen
Sulphur to Sulphur Dioxide	
.00665 lbs. x 2.0	0.0133 Sulphur Dioxide
.00665 x 1 x 3.32	0.0221 Nitrogen
Oxygen in Coal Combining with Hydrogen to form Water Vapor	
.0074 x 9	0.067 Water Vapor
Water Vapor in Coal	0.050 Water Vapor
Nitrogen in Coal	0.016
Total Carbon Dioxide	2.627
Total Nitrogen	7.4441
Total Sulphur Dioxide	0.0133
Total Dry Products	10.0844
Total Water Vapor	0.478
Total Products	10.5624

Adding to the foregoing, for each per cent of excess air, .074281 pounds of nitrogen (.016 pounds of the nitrogen in the products of combustion with no excess air was contained in the coal) and

$$\frac{.074281}{3.32}$$

or .022374 pounds of oxygen we have, for various ratios of excess air, the flue gas analysis shown in Table No. 1 for the dry products of combustion for such a coal.

Natural Gas Combustion

The products of combustion per cubic foot of the above natural gas are computed as follows:

No Excess Air

Methane to Carbon Dioxide and Water Vapor	Cu. Ft. 60°F.-30 in.	
.90 × 1.0	.900	Carbon Dioxide
.90 × 7.565	6.809	Nitrogen
.90 × 2.0	1.800	Water Vapor
Ethane to Carbon Dioxide and Water Vapor		
.05 × 2.0	.100	Carbon Dioxide
.05 × 3.0	.150	Water Vapor
.05 × 13.238	.662	Nitrogen
Nitrogen	.050	
Total Carbon Dioxide	1.000	
Total Nitrogen	7.521	
Total Dry Products	8.521	
Total Water Vapor	1.950	
Total Products	10.471	

Adding to the above, for each per cent of excess air, .07471 cubic feet of nitrogen (.05 cubic feet of the nitrogen in flue gas with no excess air is from the nitrogen content of the gas) and .07471/3.78 or .0197645 cubic feet of oxygen we have, for various ratios of excess air, the following flue gas analysis of the dry products of combustion for such natural gas:

	Cu. Ft. per Cu. Ft. of Gas	Per Cent by Volume
No Excess Air		
Carbon Dioxide	1.000	11.736
Nitrogen	7.521	88.264
Oxygen	0.000	0.000
Total	8.521	100.000
10% Excess Air		
Carbon Dioxide	1.000	10.564
Nitrogen	8.268	87.344
Oxygen	0.198	2.092
Total	9.466	100.000
30% Excess Air		
Carbon Dioxide	1.000	8.807
Nitrogen	9.762	85.971
Oxygen	0.593	5.222
Total	11.355	100.000
40% Excess Air		
Carbon Dioxide	1.000	8.130
Nitrogen	10.509	85.439
Oxygen	0.791	6.431
Total	12.300	100.000
50% Excess Air		
Carbon Dioxide	1.000	7.550
Nitrogen	11.257	84.991
Oxygen	0.988	7.459
Total	13.245	100.000

TABLE NO. 1

	Pounds	Cu. Ft. per Lb. 30 in.-60°F.	Cu. Ft.	Per Cent by Volume
No Excess Air				
Carbon Dioxide	2.627	8.548	22.456	18.249
Nitrogen	7.4441	13.503	100.518	81.688
Sulphur Dioxide	0.0133	5.769	0.077	0.063
Oxygen	0.0	11.819	0.000	0.000
Total	10.0844		123.051	100.000
10% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	16.545
Nitrogen	8.1869	13.503	110.548	81.450
Sulphur Dioxide	0.0133	5.769	0.077	0.057
Oxygen	0.2237	11.819	2.644	1.948
Total	11.0509		135.725	100.000
30% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	13.940
Nitrogen	9.6735	13.503	130.621	81.087
Sulphur Dioxide	0.0133	5.769	0.077	0.048
Oxygen	0.6712	11.819	7.933	4.925
Total	12.9850		161.087	100.000
40% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	12.923
Nitrogen	10.4163	13.503	140.651	80.945
Sulphur Dioxide	0.0133	5.769	0.077	0.044
Oxygen	0.8950	11.819	10.578	6.088
Total	13.9516		173.762	100.000
50% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	12.045
Nitrogen	11.1592	13.503	150.683	80.822
Sulphur Dioxide	0.0133	5.769	0.077	0.041
Oxygen	1.1187	11.819	13.222	7.092
Total	14.9182		186.438	100.000
75% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	10.295
Nitrogen	13.0162	13.503	175.758	80.577
Sulphur Dioxide	0.0133	5.769	0.077	0.035
Oxygen	1.6781	11.819	19.833	9.093
Total	17.3246		218.124	100.000
100% Excess Air				
Carbon Dioxide	2.627	8.548	22.456	8.990
Nitrogen	14.8722	13.503	200.819	80.393
Sulphur Dioxide	0.0133	5.769	0.077	0.031
Oxygen	2.2374	11.819	26.444	10.586
Total	19.7499		249.796	100.000

75% Excess Air		
Carbon Dioxide	1.000	6.408
Nitrogen	13.124	84.096
Oxygen	1.482	9.496
Total	15.606	100.000
100% Excess Air		
Carbon Dioxide	1.000	5.565
Nitrogen	14.992	83.438
Oxygen	1.976	10.997
Total	17.968	100.000

Comparing the carbon dioxide percentage in flue gas analysis for the same conditions of excess air for burning coal and natural gas of the analysis shown we have

Per Cent Excess Air	Per Cent Carbon Dioxide in Flue Gas Coal	Natural Gas
0	18.249	11.736
10	16.545	10.564
20	15.132	9.606
30	13.940	8.807
40	12.923	8.130
50	12.045	7.550
75	10.295	6.408
100	8.990	5.565

The above results are plotted on the curve shown in Fig. 1. (See Page 33.)

A flue gas analysis for coal-firing showing 16 per cent carbon dioxide would be excellent practice. It corresponds for carbon to about 30.2 per cent excess air, and for the coal here used, to about 14.0 per cent excess air, and is not obtainable with natural gas-firing. For this same excess of air (14.0 per cent) on the natural gas referred to the carbon dioxide in flue gases would be only about 10.2 per cent, but on natural gas-firing a flue gas analysis of 10.5 per cent carbon dioxide is readily obtainable, corresponding to about 10.0 per cent excess air, which figure represents over 16.5 per cent carbon dioxide for the same excess air for coal-firing, a figure rarely obtained.

Comparative Stack Losses

Comparing the total heat losses through the stack gases for a natural gas of the analysis shown above against a coal of the analysis shown above gives an idea of the truth of the situation. For this comparison it will be assumed that gas is fired with 10 per cent excess air, and the coal with 40 per cent excess air, and that the coal as fired has a 5 per cent moisture content.

The heat loss to the stack for the above coal with a stack temperature of 562° (40 per cent excess air) is as follows:

	B.t.u. per lb. of Coal Fired
Water Vapor (from Combustion and Moisture) .478 × (212 − 60) + .478 × 970.4 + .478 (562 − 212) × .4605	613.5
Nitrogen 10.4163 × (562 − 60) × .2438	1,275.2
Carbon Dioxide 2.627 × (562 − 60) × .2025	267.05
Oxygen 0.8950 × (562 − 60) × .2175	77.2
Sulphur Dioxide 0.0133 × (562 − 60) × .1544	1.03
	2,233.98
Percentage of Heat Value as Fired $\frac{2234 \times 100}{12972}$	17.22%

The heat loss to the stack for the above gas with a stack temperature of 562°F. is as follows:

	B.t.u.
Water Vapor 1.95 ft. .0928 lbs. — .0928 x (212-60) + .0928 x 970.4 + .0928 (562—212) x .4605	119.12
Nitrogen 8.168 ft. .612 lbs. — .612 x (562-60) x .2438	74.90
Oxygen 0.198 ft. .0168 lbs. — .0168 x (562-60) x .2175	1.83
Carbon Dioxide 1.06 ft. .1170 lbs. — .117 x (562-60) x .2025	11.90
	207.75
Percentage of Heat Value $\frac{207.75 \times 100}{1003}$	20.71%

The foregoing shows stack losses for coal of 17.22 per cent, and for gas of 20.71 per cent, based upon stack temperatures of 562°F in both cases. Now in boiler-firing the soot on boiler tube surfaces has a marked effect upon the stack temperatures. In gas-firing the tube surfaces are not coated with such soot, and for the same load conditions stack temperatures for gas-firing would be lower than for coal-firing by 50 to 100 degrees. Computing the stack losses for gas-firing on the basis of lower temperatures we have losses as follows:

	512 Degrees	462 Degrees
Water Vapor	116.98	114.84
Nitrogen	67.44	59.98
Oxygen	1.65	1.47
Carbon Dioxide	10.71	9.52
	196.78	185.81
Percentage of Heat Value $\frac{196.78 \times 100}{1003}$	19.62%	
$\frac{185.81 \times 100}{1003}$		18.53%

If the stack temperature for gas-firing be 100 degrees lower than for coal-firing, then the stack losses for gas-firing would be 185.81, or 18.53 per cent of the heat value of the gas.

The net conclusion to be drawn from the above calculations is that, after giving effect to the carbon monoxide from incomplete coal combustion, the stack losses in firing coal and gas will be about the same, gas losing heat mostly on account of the water vapor formed during combustion and coal losing heat to offset it partly through water vapor formed during combustion, partly on account of the excess air requirements, and partly on account of higher stack temperatures. The added losses in coal-firing, due to power requirements for stokers and coal handling machinery, radiation and fuel losses through ash pits and to heat losses in the ashes and standby losses, usually allow gas to be fired with higher efficiences than coal. On small hand-fired plants the difference in efficiencies will be greatly in favor of gas; on stoker-fired plants the difference will be less, and on powdered coal installations the difference will be slight, if any.

Ash in Coal

It is certain that the ash in coal has no heating value and that some of the combustible portion of the coal is lost with the ash content. The amount of such losses varies with the type of installation. In powdered coal-firing such loss is very small. In stoker-firing it is an appreciable amount. In hand-firing it is a serious amount. The greater the amount of such losses, the easier it is for gas to compete, for these losses reduce the overall efficiency of coal-firing. The art of coal-burning has made advances, and such advances are well recognized. Powdered coal can be burned with as high efficiency as natural gas, and for certain classes of use, cement kilns, for example, it can produce higher efficiency because of higher flame temperature.

Domestic Use

Natural gas writers have pointed out on innumerable occasions the advantages of natural gas for household use. There is a very little sold at $2.25, but natural gas at $2.25 per thousand is equivalent to artificial gas of 556 B.t.u.'s at $1.25. This latter is a rather common price for the first 1,000 feet per month, or more, of artificial gas, and the public all over the United States has been using artificial gas at comparable rates for years in preference to coal at any price because of convenience, comfort and cleanliness. Gas at such prices covers use only for domestic cooking and water-heating, and usually only a portion of that. For house-heating purposes natural gas is quite generally sold at price of 65c per thousand or lower. This amounts to 65c per million B.t.u. and the coal man would reason that it was equivalent to 25×65c, or $16.25 per ton for coal of 12,500 B.t.u. per pound. It is not equivalent to any such figure because of the difference of the ability of the user to utilize the heat content of the respective fuels. Banking fires at night, losses with the ashes, overheating during the day, due to inability to secure close regulation, prevent the user from securing more than a minor fraction of the heat in coal in domestic appliances. The dirt and consequent cost of cleaning rugs, draperies, clothing and wood work, and the cost of ash disposal, are all factors of the cost of coal-firing in domestic use which are absent in gas-firing. These factors all enter into the relative values of domestic fuels and the gas industry has no trouble taking almost the entire domestic market against any other fuel at prices close to those mentioned above.

Now, if a family used 12 tons of coal of 13,500 B.t.u.'s per year for heating, the consumption of natural gas to replace it would be about as follows:

In furnaces:

$$\frac{12 \times 2{,}000 \times 13{,}500 \times .40}{1{,}000 \times .75} = 173{,}000 \text{ cu. ft.}$$

Cost at 60c $103.80

In stoves or space heaters:

$$\frac{12 \times 2{,}000 \times 13{,}500 \times .35}{1{,}000 \times .90} = 126{,}200 \text{ cu. ft.}$$

Cost at 60c $75.72

The efficiences as used above are about those met in usual practice, making allowance for fuel consumed in banking fires, ash pit losses, relative losses to stacks, excess heating due to inability to secure close regulation, etc. If higher efficiences be claimed for coal-firing with automatic coal stokers (Iron Fireman), or similar appliances, they are at the expense of added investment, entailing added charges against coal for interest, maintenance and electric current.

Now, in either of the above cases the domestic user effects some saving in the way of cost of firing and ash removal, interest on investment in fuel, cost of cleaning premises, clothing and draperies, which may be evaluated roughly as follows:

	Per Year
Interest on coal 2% on 12 tons @ 7.00	$ 1.68
Cost of ash disposal and labor of attendance saved	20.00
Laundry saved (curtains and apparel)	5.00
House cleaning expense saved	5.00
	$31.68
Cost of coal 12 tons @$7.00	84.00
	$115.68
Cost of gas for furnace	103.80
Cost of gas for stoves	75.72

The development of automatic coal stokers for domestic heating furnaces provides the coal dealer with a chance to compete against gas which he did not previously possess. Undoubtedly such automatic devices will eliminate a great deal of the losses formerly inherent in the use of coal in domestic furnaces. The savings effected, however, are partially offset by the annual charges for interest on the investment, maintenance of the apparatus and cost of electric power to operate them. They are quite expensive so far, and that prevents their general use.

Conclusion

The sale of natural gas for domestic purposes is readily made at prices much higher than the relative costs of coal for the same heat content by virtue of the greater efficiencies in use and the greater convenience, comfort and cleanliness. These advantages all have cash values.

For many industrial purposes, process work as distinguished from boiler use, natural gas can be and is similarly sold at prices much higher than the relative costs of coal for the same heat content because through ease of application and control and freedom from deleterious ingredients a superior product may be obtained or the loss in manufacture reduced. This is particularly true in ceramic industries and in steel making.

"The many advantages possessed by gaseous fuels make them ideal for many purposes. Owing to their gaseous state, they require no labor in handling, and their freedom from foreign matter eliminates ash and danger of contamination." "Natural gas is the most remarkable fuel of all, with it the highest temperatures that are practical are easily obtainable by proper manipulation." "In actual practice the number of heat units per ton of steel produced is found to vary from 5,000,000 to 6,000,000 B.t.u. when natural gas is used, and from 6,000,000 to 8,500,000 when other fuels are employed." The quotations are from "The Making, Shaping and Treating of Steel" (4th edition, 1925) Camp & Francis, published by Carnegie Steel Company. The last refers to open hearth furnaces.

For boiler use natural gas meets its keenest competition in those plants where high efficiency is already obtained with coal. For powdered coal replacement natural gas is worth just about its equivalent fuel replacement value on a heat unit basis, though in some cases the saving in crusher and coal handling costs gives it an added value. In other installations natural gas usually is worth more than the relative cost of coal for the same heat content by virtue of labor saving, increased efficiency of use, and other factors.

Milton F. Merl, assistant efficiency engineer, Dallas Power & Light Company, in the February, 1930, issue of *Western Gas,* says: "Where the cost is not prohibitive, gas is the ideal fuel for power plant use. It permits the keeping of an extremely clean boiler room, it can be used with a high degree of flexibility in carrying a fluctuating load, no auxiliary equipment or storage facilities are needed, the minimum amount of boiler room labor is required, and it can be burned with high efficiency." In the same issue of *Western Gas,* C. H. Delaney, engineer, Electrical Department, Pacific Gas and Electric Company, says: "Natural gas has many advantages over oil as a fuel for steam boilers. The boilers are kept cleaner due to the fact that there are no soot deposits. This helps to lower the temperature of the escaping gases and tends to increase the efficiency.

No smoke is produced when burning natural gas and no steam is required either for atomizing or for pumping and heating the fuel. No storage tanks are required and the difficulty of unloading oil barges is eliminated. Natural gas is indeed the ideal fuel."

Mr. Delaney's remarks apply with even greater force to a comparison of gas with coal. No power is required for stokers, crushers, or other coal handling machinery, no storage space is required, no handling costs incurred, and no money tied up in fuel in storage.

Year-End Sale Adds Gas Range Load

(Continued from Page 35)

An addressograph system operated from each district office is tabbed for individual appliance prospects, this information being the result of routine sales and service contacts made by company representatives throughout the year. Thus, for the range campaign, salesmen had a live prospect list available, which was added to by every possible means as the drive progressed.

Substantial advertising space was carried in newspapers throughout the company's service area for the campaign, opening with a 4-column 10-inch display in city daily papers. Smaller reproductions of the same copy appeared in weekly papers and a series of campaign advertisements followed. Window and floor displays, counter cards, direct mail and other special advertising, were used to tie in with the sale, the holiday appeal dominating all forms of publicity.

Local sales meetings were held weekly during the campaign, conducted in each district by the district commercial agent. These local sales supervisors work directly under the district manager, with the sales management at company headquarters supervising, developing sales helps, and integrating company sales effort throughout the districts.

Weekly bulletins showing the progress of the sale and listing all salesmen in the rank determined by number of ranges sold to date, were sent to every man on the force. Number of ranges sold by each man during the previous week, and the cash amount of the sales, were given in the bulletins. This procedure brought inter-district and individual rivalry to a high point.

Up to November 29, while the premium offer was in force, 207 ranges were sold. This was 43 over quota to that date, the ranges averaging $99.46 in selling price and amounting to $20,588.67 in total sales.

Final sale figures for the six weeks of the drive were $38,163.98 net, after deducting trade-in allowance—with an average net price per range of $100.70. Ranges placed on the company's lines as a result of the six-week effort numbered 379.

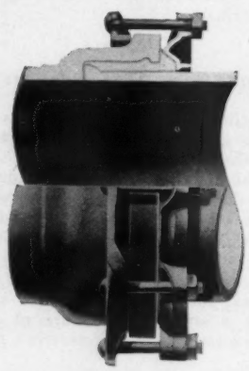
Prizes were awarded salesmen on the basis of their net range sales. As the campaign drew to a close some astonishing records were set up for individual selling. Twenty-six ranges were sold in the final week by the winning salesman, John Criddle of the company's Orange County district, to whom went the $50 first prize money.

As is often the case during concentrated selling on any one appliance, the range campaign operated as a stimulus to sale of other equipment than ranges. General merchandise sales for the period of the campaign were ahead of the corresponding period of 1929, and this result was largely attributable to the range sale.

S. R. Dresser Mfg. Co. Announces New Dresser Repair Clamp

The S. R. Dresser Manufacturing Co., Bradford, Pa., has recently announced a new bell and spigot repair clamp known as Style 4½ H.P.

In this clamp a gasket of reverse wedge-shape overlaps the caulking and insures a good seal whether the joint is straight or out of alignment. The clamp ring confines the gasket and regulates its compression.



The manufacturer claims that sufficient flexibility is provided by the resiliency of the gasket to permit movement without impairment of the utility of the clamp. The device is simple in design, light in weight but has strength at points of stress. A descriptive folder is available from the manufacturer.

Southern Counties Gas Co. Enlarges Venice Office

Enlarged to double its original size, the Venice office of the Southern Counties Gas Company located at 70 Market Street, Venice, Calif., was thrown open to the public on Saturday, February 21. Refreshments, music and a staff of ushers to show visitors through the building, made the opening a successful public event.

An attractive display floor, for conveniently showing the company's line of modern gas appliances, has been made possible with the completion of the new addition to the office.

Goodrich Compressor Station Completed by United

Construction of the compressor station at Goodrich, Texas, has been completed by the United Gas Co., with A. G. White, chief engineer, placed in charge.

Three buildings house the compressor engines and equipment, and eight frame cottages have been constructed for employees and their families.

The main compressor building contains three 1000-h.p. engines, while a 200-h.p. engine direct connected to an A.C. electric generator is reserved for emergencies in the auxiliary building.

State Fuel Supply Co. Preparing to Serve Laverne

Work has been started by the State Fuel Supply Co. of Oklahoma City on 8 miles of 4½-inch gas pipe line to Laverne and a gas distribution system in that city. The supply will come from wells on the Sinclair lease. Buffalo will be supplied from the same source, according to G. R. Carpenter, superintendent of the company.

Boise City, Okla., to Vote March 7 on Franchise

Boise City, Okla., will vote, March 7, on granting a natural gas franchise to the Cimarron Utilities Co. If the franchise is granted work will begin on the new system as soon as material can be assembled, according to C. R. Stahl of Borger, Texas, general manager of the company.

Fulton, Mo. to Vote on Municipal Bonds, March 3

March 3 is the date set for a special election at Fulton, Mo., to decide upon a bond issue of $80,000 to construct a natural gas distribution system in the town. The system will be municipally owned. Gas will be brought from an extension of the Panhandle Eastern Pipe Line Co.'s line from Texas.

H. E. Dowd Gas Co. Gets Franchise at Porum

H. E. Dowd Gas Co. on February 11 was granted a gas franchise at Porum, Okla. The company owns 20 leases near the city and plans to drill for gas. The franchise provides that the gas must be furnished by August 1.

Gas Cooking School

Portland Gas & Coke Co., Portland, Ore., in cooperation with a local newspaper, is planning to conduct a gas cooking school at Dallas, Ore., March 3, 4, and 5. The school will be conducted by Miss Willa Campbell.

No Tax on Montana's Gas Wells

The bill placing a tax on natural gas wells in Montana was killed in the Montana House of Representatives on February 13, according to L. A. Foot, attorney general for the State of Montana.

Gas Service For Newberg

Portland Gas & Coke Co., Portland, Ore., is constructing a distribution system at Newberg, Ore.

J. M. Drabelle

J. K. Swanson

R. B. Searing

Mid-West Gas Ass'n Annual Meeting

THE 26th Annual Convention of the Mid-West Gas Association will be held April 13, 14 and 15, at Dubuque, Iowa, and according to the tentative program given out by Joe Carmichael, director of the Iowa Committee on Public Utility Information, Des Moines, Iowa, an interesting session is assured. Following a call to order by President J. M. Drabelle on Monday morning, April 13, at 10 a.m., the mayor of the city will welcome the delegates. George McLean, of Dubuque, member of the governing board of the Iowa Committee, will respond.

The following program details are tentatively planned:

Monday Morning, April 13

"What's Ahead for the Gas Industry"—Alexander Forward, American Gas Association.

"Our Relations with the Public in Communities Served"—John Larned, Don Barnes, George Lee.

Afternoon

Report of Technical Representative, and Distribution Conference and Meter School Resume—John Drabelle.

"Natural Gas Distribution and Its Problems," W. I. Battin, Central Public Service Co., Chicago, Ill.

"Experiences and Developments on Changing over Consumers' Equipment," Fred J. Gunther, Iowa-Nebraska Light & Power Co., Lincoln, Nebraska.

Tuesday Morning, April 14

Report of Commercial Representative—John Drabelle.

Subject to his choosing, W. H. Hodge, Byllesby Engineering and Management Corporation, Chicago, Ill.

Report of Accounting representative.

"Developing Gas Load Through Water Heating," F. A. Lemke, Ruud Manufacturing Co., Pittsburgh, Pa.

Report of Accounting representative.

Educating the Organization Employees:

In Manufacture.

In Distribution.

In Utilization.

In Specific Duties—Lester Eck, Minneapolis Gas Light Co., Minneapolis, Minn.

Report of Manufacturers' representative.

Choice of subject—Louis Stein, manager gas sales, Minneapolis Gas Light Co., Minneapolis, Minn.

Wednesday Morning, April 15

"Training the Organization in House Heating," Lyle Harvey, Bryant Heating & Ventilating Co., Cleveland, Ohio.

"Building Load Quickly with Conversion Burners," M. L. Roberts, Roberts Gordon Appliance Co., Buffalo, N. Y.

Meeting of new officers and council.

Officers of the Mid-West Gas Association are as follows: J. M. Drabelle, president; John K. Swanson, vice-president; W. E. Derwent, second vice-president; and R. B. Searing, secretary-treasurer.

Tri-Cities Utilities Gets Regina Franchise

Tri-Cities Utilities, Ltd., headquartered at Saskatoon, Sask., subsidiary of the Northern Utilities Co., has been awarded the franchise to supply Regina with natural gas. Supply will be brought, under present plans, from the Kinsella and Wainwright fields in northern Alberta, some 400 miles distant. A similar franchise was refused the company in Saskatoon.

Zillah, Wash., Franchise

Northwestern Natural Gas Co., Grandview, Wash., has been granted a franchise for the service of natural gas in Zillah, Wash., and has filed an acceptance of the terms.

Vote to Construct Municipal Gas System

Voters of Garber, Okla., in an election February 18, authorized the issuance of $27,000 in bonds for construction of a municipally owned natural gas transmission and distribution system. The Consolidated Gas Utilities Co. holds a franchise in Garber.

Applies to Serve Snohomish

Western Empire Gas Co. has applied for a franchise to serve Snohomish, Wash., with natural gas.

Three More Permits to Iowa Electric

Iowa Electric Co., Cedar Rapids, Iowa, has been granted franchises in Wiota, Anita and Casey, Iowa.

Conversion Burner as a Load Builder

(Continued from Page 31)

him of its many advantages over other fuels. If, however, the consumer is not satisfied the gas burner can be easily removed and he is not greatly inconvenienced.

The third objection, "Fear of high cost of operation," can best be overcome by selling the customer on the idea of giving gas an actual test in his home. We believe that it is much easier to sell the idea of the conversion burner in this case rather than gas designed equipment due to low initial cost, minimum interruption of routine and ease with which equipment may be removed in case of dissatisfaction.

Undoubtedly the conversion burner is the logical answer to the fourth objection, which is, "Unwillingness to make the large initial investment in gas designed equipment and dispense with the present coal equipment which is in good condition."

As far as the renters are concerned, and there are a lot of them, the conversion burner seems to be the logical means, at least for the present, through which their heating load may be obtained.

Through a good, high class conversion installation we find that we are able to approach the operating cost of the average gas designed appliance within 10 to 12 per cent, and in some cases we have been able to better this efficiency. We are therefore able to offer our consumers, through good conversions, automatic heating service at a low initial investment expense.

We know that sooner or later the present coal equipment in which conversion burners have been installed is going to wear out and we believe that when that time comes the consumers will have forgotten the above objections and be ready to install gas designed equipment, when told of its greater efficiency. In other words, through the use of conversion burners we have been able to secure quickly a very satisfactory gas load which otherwise would have taken us years to get on our lines, and then we would have missed those customers who could not afford gas designed equipment.

There are, of course, many problems encountered which must be overcome in making successful conversion installations. Some of the more important ones are:

1. To devise equipment to cover factors and principles used in original design of coal equipment, the principal ones being the radiant and convected heating effects of burning coal.
2. The shortness of hot gas travel before the flue is reached.
3. Erratic draft conditions due to wind and location and construction of chimney.
4. Undersized or improperly designed heating plants.

The coal boiler or furnace requires an equal distribution of heat in the firebox for best results, making necessary different sizes and different shapes of burners for round and rectangular boilers and furnaces. Coal designed equipment requires a strong draft, necessitating a short hot-gas travel and therefore a high stack loss, unless suitable baffling or other means of retarding the gas heat is introduced. It is frequently necessary to install an additional damper in the flue pipe and occasionally a down draft diverter. The amount of secondary air necessary to support combustion must also be properly regulated and distributed. If the gas pressure at the burner fluctuates materially an appliance regulator will save many service calls for the purpose of adjustment and high bill complaints. It is very important also that the service line, house piping and meter be of sufficient size to take care of every heating job adequately.

These are the main problems of conversion installations and the above requirements should be conformed to as nearly as possible if satisfactory results are to be obtained. Different types of burners satisfy these conditions in various ways. The most perfect burner improperly applied or installed will make an unsatisfactory conversion. One of the most important things to successful conversions, then, is the proper application and installation of the burners.

It must also be remembered that the gas conversion is not a cure-all for sick jobs. It is important, therefore, before converting a coal heating plant to determine whether or not the job worked satisfactorily with coal.

It is very important, too, that the heating job, whether it be conversion burner or gas designed equipment, be sold correctly. Our salesmen are instructed to keep away from technicalities as far as possible and to talk the health, cleanliness, comfort and convenience which gas heat will bring to the home.

We have never followed the policy of estimating the prospective customer's bills by the month, but have rather given him the actual cost of gas used in heating similar houses with similar appliances, thereby allowing the customer to draw his own conclusions as to what he may expect the cost of gas service to be in his particular case.

In a little over two years time we have been able to bring our average domestic gas consumption up to 140 M.c.f. of gas per customer per year. This is entirely exclusive of all commercial and industrial consumption. We feel that such a record would not have been possible without vigorously pushing conversion burners.

Sales — The Year 'Round

(Continued from Page 37)

vent an accumulation of used machines in the warehouse. It is generally customary to make an extra charge for Roll-a-Tubs. Giving these free during a laundry equipment campaign makes a very nice inducement for immediate purchase A laundry equipment sale has another advantage; it requires a higher type of salesmanship, and is good training for the sales force.

Heating Equipment: This is the chief domestic load of gas companies today and every means should be taken to hold the present load and to increase it. It is squarely up to the gas companies to select the latest and most efficient heating appliances available and to see that they are properly installed and adjusted, and that the customer is satisfied with the service they are giving him. It is up to the gas companies to sell to every customer on their lines. Numbers of excellently furnished homes with expensive radios and very poor heating equipment and other gas burning appliances, may be found on every system. They are proof that we have not been doing the job of selling that we should have done.

In this section of the country a large part of the people do not heat all of the house all of the time, but are prone to live in one or two heated rooms while the remainder of the house is cold. It is going to take a lot of missionary work to induce these users to heat all of the home comfortably. There are many reasons why the customer should do this, from his standpoint. Better health will be had by all members of the family if they live in a house which is adequately and comfortably heated. Gas companies in the southwest have a lot of work to do in this particular field, and it offers a nice increase in load if we do the job properly.

House cooling also offers fine prospects, provided we can work out a practical unit that is not prohibitive in price. Several agencies are at work along this line at the present time, but the job is a big one. We do not have the degree days of the colder climates and, therefore, we must heat these homes properly in winter and cool them in summer if we have anything like the gas consumption per meter we should have.

A special discount should be allowed for purchase and installation during spring and summer months. Chief among the numerous advantages to be gained are: Off-peak installations cost less; the sales force is kept intact the year around; the necessary volume of sales is provided for otherwise lean months.

Christmas Specials: What gift could be more appropriate or have more utility value to the whole family than any one of the modern gas appliances? Why not offer the gas fired refrigerator, at special prices and on special terms, as a Christmas campaign special? Any of the other gas appliances such as a new range, storage heater, gas fired parlor furnace—and there are some very nice looking ones on the market—would make very excellent and practical gifts for the whole family. These inducements also tend to reduce the stocks to a minimum before the yearly inventory period.

Advertising: At the beginning of any campaign on any appliance we favor using at least a full page advertisement in the Sunday paper. More people read the Sunday edition, this issue also has a much wider circulation than that of the week day paper, and will attract out of town business. Smaller ads should be run at intervals during the campaign to constantly hammer home the message that something special is being offered for a limited time only, and for this reason it is felt that it is better to have several smaller ads rather than two or three full page ads during the campaign period.

Radio advertising has grown very effective and has demonstrated that it will open the doors to the house-to-house men. With a program three or four times a week, specials are easily introduced, and the response will be gratifying.

It is important, if future campaigns are to be effective, that the special inducement be removed after the campaign has been closed. Otherwise campaign advertising will loose its value.

L. M. Holmes on Staff of Central Public Service Co.

L. M. Holmes, industrial gas engineer, has been added to the commercial department of the Central Public Service Co., Chicago, Ill. Mr. Holmes was formerly manager of gas sales for Winnipeg Electric Co., Winnipeg, Man.

Newman Gas Equipment Co. Is New California Organization

John P. Newman, formerly northern California representative for the Natural Gas Equipment Co., has recently formed a new organization of which he is the head, to be known as the Newman Gas Equipment Co., with main offices at 447 Sutter St., San Francisco.

Mr. Newman will conduct an engineering service and sales organization specializing in the Newman gas burner for commercial and industrial heating requirements, and the Bailey regulator for gas fuel and all pressure regulation.

Both the burner and the regulator are San Francisco made products, and are known to the trade throughout northern Califonia.

Personnel Changes in Washington Gas & Electric

Washington Gas & Electric Co., Tacoma, Wash., announces the appointment of Russell E. Collins as manager of the Centralia and Chehalis branch of the company. Mr. Collins was formerly manager of the company's office at Auburn, Wash., his place there being taken by Ray Alexander of Tacoma.

Farber and Laddonia About to Get "Natural"

The towns of Farber and Laddonia, Mo., are ready for natural gas service, the distribution systems having been installed by the Missouri Power & Light Co., Kansas City, Mo., holder of the natural gas franchise. Supply will come from the Panhandle Eastern Pipe Line Co.'s extension.

Minnesota Northern Plans Extension from Williston to Regina

Minnesota Northern Power Co., Minneapolis, Minn., has under project a line to be constructed from Williston, N. D., present terminus of the Montana-Dakota Power Co.'s Glendive-Williston line, to Regina, Sask. The line would be approximately 175 miles long, and would serve Weyburn and Estevan, Sask., en route.

Northwest O. & G. Assn. in Session Feb. 27, 28

The Northwest Oil and Gas Association, comprised of natural gas and oil men from sections of Oregon, Washington, Idaho and other Pacific Northwest points, convened at the Heathman Hotel, in Portland, Ore., on February 27 and 28.

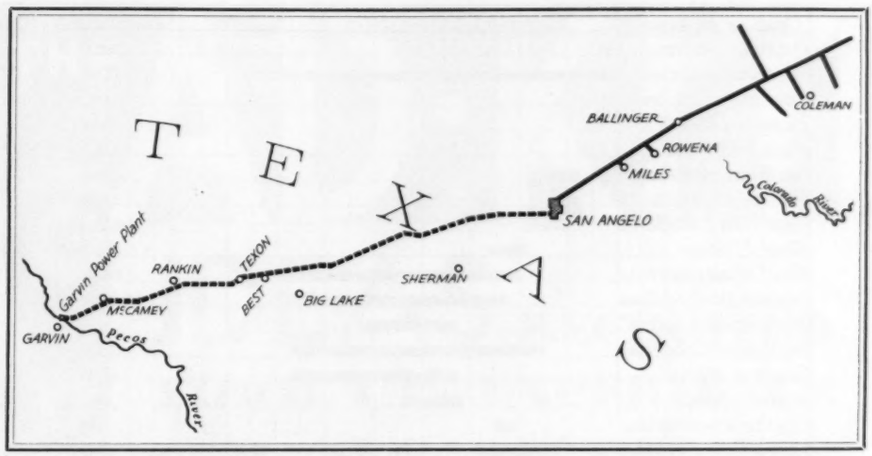
The primary purpose of the sessions was the organization of an Oregon chapter.

Southern Counties Extending System in Monrovia District

Extending its distribution system to serve a new territory between Sierra Madre and Pasadena, the Monrovia District of the Southern Counties Gas Co., Los Angeles, Calif, has recently begun work on a natural gas main to cost approximately $10,000 and to serve a community which has a population of about 300.

De Soto to Vote on Franchise

De Soto, Mo., on March 6 will vote on the granting of a natural gas franchise to Thos. F. Bowdern, St. Louis.



120-Mile Line to Build Immediately

TEXAS Public Service Co. of Austin, Texas, a subsidiary of the Peoples Light & Power Co. of New York, has announced the immediate construction of a 120-mile gas line project consisting of 80 miles of 12-inch pipe extending north-eastward from the Big Lake gas fields of Texas to San Angelo, Texas, and a 40 mile 8-inch line extending south-westward from the field to Girvin, Texas.

At Girvin, the line will supply gas to the power plant of the West Texas Utilities Co. The San Angelo end of the line will augment the supply of gas to that city. Natural Gas Engineering Corp., a subsidiary of the Trojan Engineering Corp., maintaining headquarters at New York City, will have charge of the construction of the line.

Actual construction will be begun around the first of March, with the line scheduled for completion 60 days later. Texas Public Service Co., which will operate the line, purchased the original gas system serving San Angelo, from the Oklahoma Natural Gas Corp. on December 31. Both Texas Public Service and Oklahoma Natural are subsidiary to Tri-Utilities Corp. of New York, a G. L. Ohrstrom interest.

Oklahoma Natural Appeals Rate Decision

THE OKLAHOMA Natural Gas Corporation has appealed to the Oklahoma Supreme Court from a temporary order of the Oklahoma Corporation Commission reducing the gate rates of that company for natural gas to 25 cents per 1,000 cubic feet, and a corresponding cut in gas distribution rates, in 46 Oklahoma towns supplied with natural gas by the company. The order is made effective for February, March and April pending the outcome of a continuation of the investigation by the Corporation Commission into the rates charged by the company.

The Oklahoma Natural Gas Corp. applied to the Corporation Commission for reversal of the temporary order, but this was denied. The company then filed an application with the commission for authority to appeal to the state supreme court and for authority to post a supersedeas bond to suspend operation of the temporary order pending final determination of the present gas rate investigation. The application to appeal was granted, but the application for supersedeas was denied. The State Supreme Court also denied an application for supersedeas. The company claims that this proposed reduction would make it extremely difficult to continue the present high standard of service to the cities and towns in Oklahoma and would reduce the net returns of the company to the danger point.

On February 17 the District Court for the Western District of Oklahoma issued an order restraining the Corporation Commission from enforcing the rate reducing provision of the Commission's temporary order. A hearing on this restraining order was to be held on February 27, the gas utility expecting the District Court to then issue a temporary injunction setting aside the temporary order of the Commission.

The net effect of such an injunction would be that present rates would be continued until the rate case now before the Corporation Commission is finally settled.

Illinois Gas Association in Annual Convention

The Illinois Gas Association, together with the Illinois State Electric Association and the Illinois Electric Railways Association, will meet in annual convention on March 12. The three associations will meet jointly for a general session, which will be followed by separate meetings for each.

At the general session, held on March 12, C. E. Paige, Brooklyn Union Gas Co., treasurer of the American Gas Association, will speak.

The Gas Association program, to be held on March 12 at 2:00 p. m., will be presided over by Howart T. East, president of the Association, and will feature the following addresses:

"Therm Basis of Charging for Gas"—E. R. Weaver, U. S. Bureau of Standards, Washington, D. C.

"A Promotional Program for House Heating in Illinois"—Lyle C. Harvey, Bryant Boiler Co., Cleveland, Ohio.

"A Gas Company and Its Employees"—B. J. Mullaney, vice-president, Peoples Gas Light and Coke Co., Chicago, Ill.

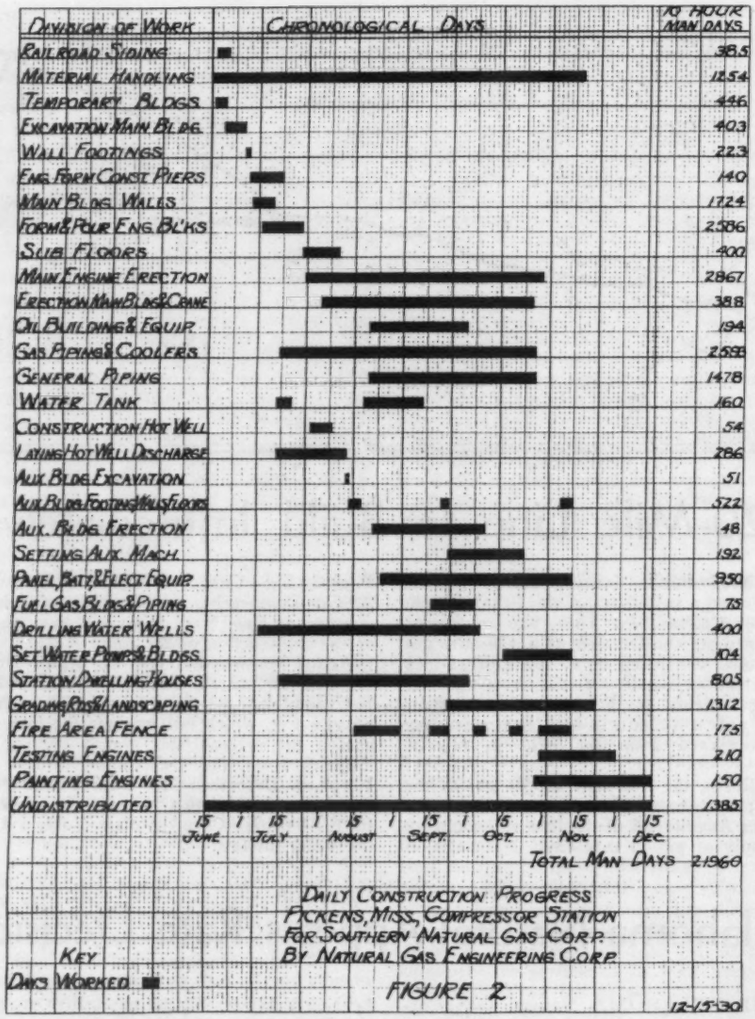

Division of Work
Chronological Days
10 Hour Man Days
Railroad Siding 385
Material Handling 1254
Temporary Bldgs 446
Excavation Main Bldg. 403
Wall Footings 223
Eng. Form Const Piers 140
Main Bldg. Walls 1724
Form & Pour Eng. Bl'ks 2586
Slab Floors 900
Main Engine Erection 2867
Erection Main Bldg. Crane 388
Oil Building & Equip. 194
Gas Piping & Coolers 2595
General Piping 1478
Water Tank 160
Construction Hot Well 54
Laying Hot Well Discharge 286
Aux. Bldg. Excavation 51
Aux. Bldg. Footing & Floors 522
Aux. Bldg. Erection 48
Setting Aux. Mach. 192
Panel, Batt. & Elect Equip. 950
Fuel Gas Bldg. & Piping 75
Drilling Water Wells 400
Set Water Pumps & Bldgs. 104
Station Dwelling Houses 805
Grading, Roads & Landscaping 1312
Fire Area Fence 175
Testing Engines 210
Painting Engines 150
Undistributed 1385
15 June 1 15 July 1 15 August 1 15 Sept. 1 15 Oct. 1 15 Nov. 1 15 Dec.
Total Man Days 21960
Daily Construction Progress
Pickens, Miss. Compressor Station
For Southern Natural Gas Corp.
By Natural Gas Engineering Corp.
Key
Days Worked
FIGURE 2
12-15-30

Fig. 2

The Pickens, Miss., Compressor Station

(Continued from Page 30)

taken from the intake header to the fuel gas house where pressure is regulated to 40 lbs. per sq. in. for measurement by orifice meters. Fuel gas is then reduced to 12 oz. pressure for transmission to the engine regulators through a 12-in. header outside the main building at the power end.

The station is equipped with a 20-ft. by 30-ft. combination office and warehouse. One 5-room house, three 4-room houses, two 3-room houses, and one 5-car garage were built for the operating crew. A 7-ft. rough top, wire fence of about 1,850 ft incloses the "fire area" of the station proper. All electric lights in positions subject to contact with gas are vapor proof.

Fig. 2 presents diagrammatically the order and duration of each of the principal divisions of work and also the distribution of the number of 10-hour man days of field construction work. In Fig. 2 the item "undistributed" includes time keeping, warehousing, trucking, and miscellaneous. The average number of men per day employed was 120 with a peak day of about 300 men. Practically all of the 215 cars of material for the station were moved in on the railroad siding. The first compressor unit was rolled over on October 30, 137 days after the breaking of ground.

The Pickens Compressor Station was built under the supervision of the Natural Gas Engineering Corp. with Rex T. Lambert acting as field superintendent. A. M. Lockett & Co., Ltd., of New Orleans, La., acted as the principal contractor with George E. Milligan as construction superintendent.

Acknowledgment is gratefully made by the author for the cooperation of Rex T. Lambert, Natural Gas Engineering Corp., and G. E. Milligan and B. S. Nelson of A. M. Lockett & Co., Ltd.

Advertising Featured in So. Cal. Gas. Co. Meeting

The February 20 department head meeting of the Southern California Gas Co., held at the Alexandria Hotel, Los Angeles, was given over to an exposition of gas advertising. F. H. Holden, supervisor of advertising and publications for the company, was in charge of the evening program, which opened with a dinner. The company's orchestra and the "Downey Quartet" were heard for several much enjoyed musical numbers during the evening.

Wm. J. Betting of the Mayers Co., Los Angeles advertising firm, brought an interesting message on advertising in present day business, with particular application to the gas utility's program.

Mr. Holden outlined advertising activities conducted by the gas industry, dealing with the coordination of company advertising with other programs. These latter included advertising of the A.G.A., national manufacturers, Pacific Coast Gas Association, and the joint natural gas advertising now being conducted by the three companies headquartering in Los Angeles.

A humorous skit by Douglas Buckler and Robert Crosby of the company's advertising department dealt with the technique of producing advertising "copy."

F. M. Banks, general superintendent of sales, concluded the speaking program with a discussion of advertising from the standpoint of the sales department.

New 5- and 10-foot Provers by American Meter Co.

The American Meter Co. has brought out the "American" meter prover in 5- and 10-foot sizes, which afford more than twice the capacity of the former type.

		Capacity per hr. at 1½" pressure	
No.	*Size*	*Former Type*	*New Type*
AL 13	5 ft.	950 cu. ft.	2250 cu. ft.
AL-14	10 ft.	1800 cu. ft.	5000 cu. ft.

These improved models enable the proving of larger meters at rates equal to or in excess to rated capacities, at the same time reducing the pressure loss at the meter inlet.

Following are new features of design and construction of the 5- and 10-foot provers:

The airway diameter from the interior of the bell to the free end of the hose has been increased to 2 inches in the 5-foot prover and to 3 inches in the 10-foot prover. The throw or capacity is thereby increased more than 100 per cent (see table above).

A larger dry well hose and connections have been incorporated to conform to the increase in the area of the airway.

A gate valve replaces the cock formerly used and regulates the flow of air from prover to meter. The inside diameter of the valve when fully open is the same as the diameter of the piping on either side.

Information for the proving room is given in the company's new Handbook on Displacement Measurements pages 95-120.

Merger of Minneapolis-Honeywell and Time-O-Stat

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has acquired all the assets and business of the Time-O-Stat Controls Corp., Elkhart, Ind., the latter organization to be operated as a division of the Minneapolis company, effective February 17.

Unnecessary duplications in certain equipment can be eliminated, and all items in the enlarged Minneapolis-Honeywell line of devices will be made to complement each other.

The Minneapolis-Honeywell line will now comprise the Time-O-Stat gas hot-water heater control, mercury tube switch devices, refrigeration controls, and electric sign flashers, in addition to its former line of damper regulators, controls for oil or gas burners, unit heater and sectional controls, stoker controls, individual radiator controls, and motorized valves and controllers for industrial processes.

IDEAS RECRUITED FROM THE EXPERIENCE OF MANY GAS COMPANIES

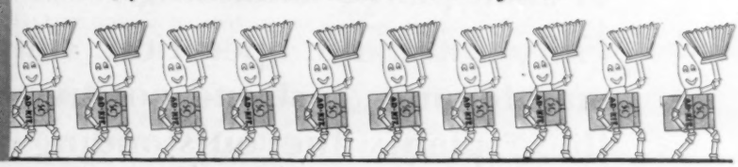
IS NOW READY FOR SERVICE!

Here is a new selling tool for the Gas Industry! It is a careful summary of successful merchandising and advertising ideas used by the Industry in selling house-heating equipment. The SC AD-KIT will guide you in quickly marshalling *your own ideas* into effective campaigns this spring... for Janitrol . . . for Columbus Gas-Fired Furnaces.

Briefly the principal units of the AD-KIT are:

1. **"Advertising GAS the Better Fuel for Home Heating" —32-page book illustrating use of Ad-Kit material, review of successful newspaper and direct mail campaigns, contests, sales promotion methods used by prominent Gas Companies, window displays, merchandising plans, etc.**
2. **Layout Pad for designing your own newspaper advertisements.**
3. **Suggested newspaper advertisements for JANITROL.**
4. **Suggested newspaper advertisements for COLUMBUS Furnaces.**
5. **Miscellaneous Cut and Mat Service from which you can build your own newspaper advertisements.**
6. **Direct Mail Pieces on both Janitrol and Columbus Furnaces which will tie in with your own localized plans.**

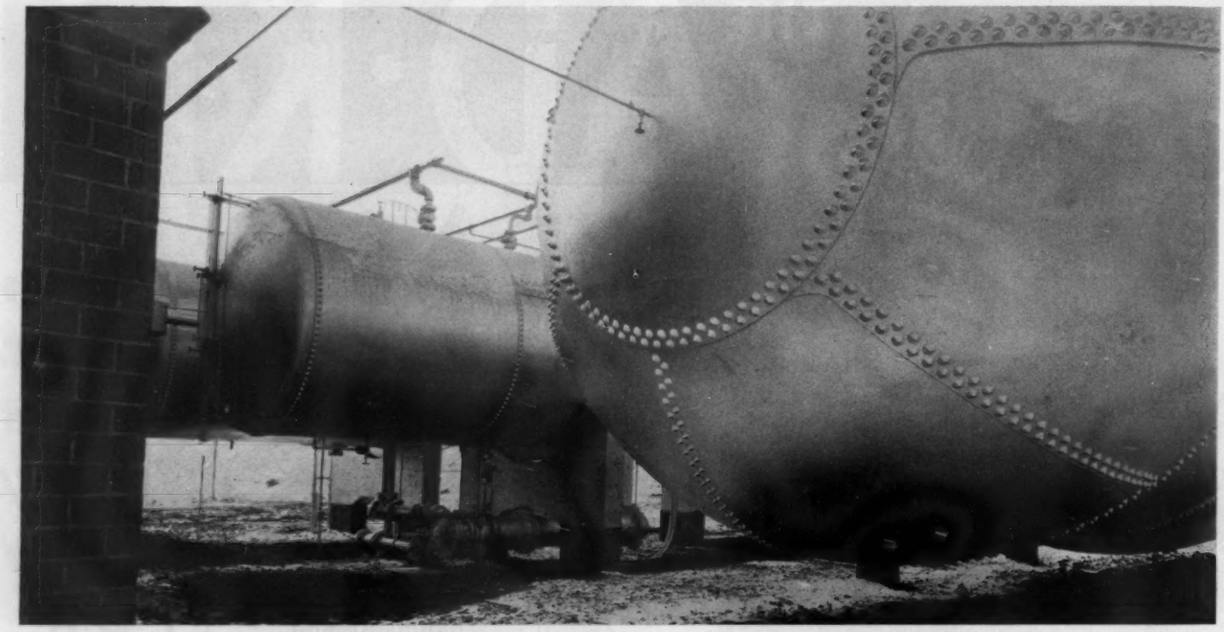
Ready for distribution soon . . . *Write for it!*



OPERATED BY HENRY L. DOHERTY & COMPANY

Surface Combustion

SURFACE COMBUSTION CORPORATION, TOLEDO, OHIO • • SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES



LIQUID AND GAS STORAGE TANKS FOR AIR-BUTANE GAS PLANT
AT KLAMATH FALLS, OREGON. (POPULATION 18,000.)

THESTAN

Carbureted air-butane plants designed and built by THEBO, STARR and ANDERTON, INCORPORATED, now serve nine Pacific Coast cities as part of a program of such plants extending from Canada to Mexico.

Fully automatic operation, simplicity of design, low maintenance cost and positive B.T.U. control make these plants the outstanding development in the air-butane branch of the gas industry.

THEBO, STARR and ANDERTON

Incorporated
Designers and Builders
Sharon Building, San Francisco

BUTANE - PROPANE NEWS
Covering Liquefied Petroleum Gas Service

13 Years Progress Bring Industry *into* Current Expansion Era

By JAMES B. GARNER

Propane-Butane Division
Hope Construction & Refining Company

PRIOR to 1917, the liquefied hydrocarbons—butane, iso-butane, and propane—now commodities of great commercial importance—were objects solely for study in the scientific laboratories. Various synthetic and analytic processes, requiring expensive raw materials and entailing fine technical skill, were used in the preparation of minute quantities of these hydrocarbons in the gaseous form. There was little or no thought of ever producing these substances in such large quantities that tank cars, tankers and pipe lines would be required for delivery of them, to points of mass consumption. Such a thought would have been akin to a dream or a vision. During the past 13 years, remarkable progress has been made. Research and development work, the opening up of large and productive areas of natural gas and oil, and the marvelous inventive genius of petroleum technologists in perfecting processes and apparatus for the cracking of oil—all these have contributed to the birth and growth of the so-called liquefied petroleum gas industry—the powerful ally of the two great public serving industries—gas and petroleum.

So much has been said and written relative to the sources of supply of these hydrocarbons, their physical properties and their chemical possibilities, that the present discussion will be limited to a brief review of the salient features of supply and production, and the pertinent physical properties which are of prime significance to the gas and petroleum industries.

Sources and Supply

There are two sources of commercial quantities of butane, iso-butane and propane:

(1) Natural gas as it is delivered from natural gas and oil wells; and

(2) Refinery gases as they are produced in cracking operations.

The quantities of these hydrocarbons, which will be recoverable from the two sources of supply, will depend upon:

(1) The volumes of gas available for treatment;

(2) The content of these hydrocarbons in the gas as treated; and

(3) The sale value when recovered.

Suffice it to say, that the volumes of the gases available for treatment and the content of hydrocarbons in these gases are equal to, and adequate for, all possible market requirements. The processing of these gases for the isolation of the liquefied hydrocarbons will be contingent upon whether it is worth while or not. We have no misgivings regarding the availability of the supply. Our concern is: 'Will it pay the natural gas and petroleum industry to isolate and market these hydrocarbons as commodities?' The supply is available on a sound, economic basis. The demand must be certain and regular if production costs are to be held at a low figure. The gas industry must likewise find it, not only profitable, but also progressive, to utilize these hydrocarbons for domestic and the manifold and varied industrial purposes.

Methods of Production

There are three well known methods of isolating or producing the liquefied hydrocarbon gases in a high state of purity from natural and refinery gases:

(1) *The adsorption method.* This method involves the use of solid adsorbents, like activated charcoal and silica gel, for selectively condensing the desired hydrocarbons from the gas stream, subsequent distillation, compression, cooling, and fractionation;

A Chronicle *for* Butane-Propane Development

WITH this issue, "Butane-Propane News" becomes a regular feature of *Western Gas.* In this section liquefied petroleum gas developments of both technical and news interest will be offered the reader.

The field which these gases are serving is ably reviewed in the current issue by James B. Garner, in a February discussion before the New England Gas Association.

For the past five years or more it has been evident that liquefied petroleum gases were marked for exceptional expansion, but the potential scope of their market is only now beginning to be recognized. R. W. Thomas, vice-president and general manager of the Philfuels Co., passed the future of the industry in review in his remarks before the Manufacturers Section of the American Gas Association last October. Among other things he noted:

1. That there are 2,423 towns of 1,000-2,500 population, and 667 towns of more than 2,500 population in the United States which have no piped gas. These represent nearly 900,000 potential customers for gas service, of which 450,000 may conservatively be regarded as eligible for liquefied gas distribution through central plants.

2. That there are 13,000,000 families in addition to those in the above group, which are now using low grade fuels. Bottled gas service may conservatively lay its program to sell 1 out of every 10, or some 1,300,000 consumers, in this market.

3. That the above combined fields will eventually call for an investment of about $200,000,000 for minimum requirements in gas appliances, with an ultimate replacement market of perhaps $30,000,000 annually.

4. That the per customer outlay in plants and distribution equipment may be estimated at $100 for central plant systems, and about $90 for service facilities in bottled gas distribution. Aggregate investment in equipment for the two types of service would be a minimum of $162,000,000 for the market outlined above.

THESE estimates are entirely on the conservative side, as can be appreciated by considering some of the programs of individual companies which are actively developing their distribution outlets. The present year will see several hundred additional central butane plants constructed, with nearly 100 already in service or building. Bottled gas service is growing by geometric progression, authorities estimating that the number of its consumers doubled in 1930.

It will be the function of "Butane-Propane News" from month to month to piece together the story of this aggressive new industry's growth, as it enters its logical and accessible market.

Liquefied Petroleum Gases	S-O-Tane (Butanes)	Hopane (Propane)
1. Normal state at 60° F. and 30-in. mercury	Gas	Gas
2. Specific gravity of gas (Air=1)	2.07	1.52
3. Specific heat of gas at constant pressure—B.t.u. per lb.	0.459	0.473
4. Limits of inflammability, % of gas—		
lower limit	1.9	2.4
upper limit	8.5	9.5
5. Gross heating value per cubic foot at 60° F. and 30-in. mercury	3,255	2,503
6. Cubic feet of gas per pound of liquid	6.54	8.59
7. Specific gravity of liquid 60°/60° F.	0.574	0.51
8. Pounds per gallon at 60° F.	4.78	4.25
9. Cubic feet per gallon	31.27	36.51
10. Mean coefficient of expansion—		
0° to 50° F.	0.001045	0.00143
50° to 100° F.	0.001205	0.00180
11. Heat of vaporization—		
B.t.u. per pound	162.2	183.1
B.t.u. per gallon of liquid at 60° F.	775.7	778.2
12. B.t.u. per pound of liquid	21,300	21,500
13. B.t.u. per gallon of liquid	101,800	91,370
14. Vapor pressure of liquid—Pounds per Sq. In. (Gauge)		
@ 10° F.	1	32
@ 32° F.	8	58
@ 60° F.	24	98
@ 80° F.	38	134
@105° F.	62	192
@130° F.	93	269
15. Cubic feet of air required for complete combustion—		
1 cubic foot of gas	31.1	23.91

Fig. 1. Industrially Important Physical Properties

(2) *The absorption method.* This method involves the use of a suitable liquid solvent for dissolving these hydrocarbons from the gas stream, subsequent distillation, compression, cooling, and fractionation; and

(3) *The mechanical method.* This method involves the use of machines wherein very low temperatures and high pressures may be realized in liquefying a mixture of the desired hydrocarbons and subsequent fractionation thereof.

The method employed most generally is the so-called *absorption method.* The purity of the products depends upon the raw material, and the refinement and efficiency of the process and apparatus used. If the raw material contains hydrogen sulphide, organic sulphur or corrosive elements or compounds, these materials must be removed by accessory processes and equipment. The art of production has so advanced that it is commercially possible and practicable to obtain the several separate hydrocarbons of 97 or higher percentage purity.

A brief compilation of the industrially important physical properties of two commercially known liquefied petroleum gases—"S-O-Tane" and "Hopane"—has been made and is herewith submitted:

It is imperative that the producer and consumer of liquefied petroleum gases shall have a knowledge of these physical properties so as to enable them to solve the problems which may arise:

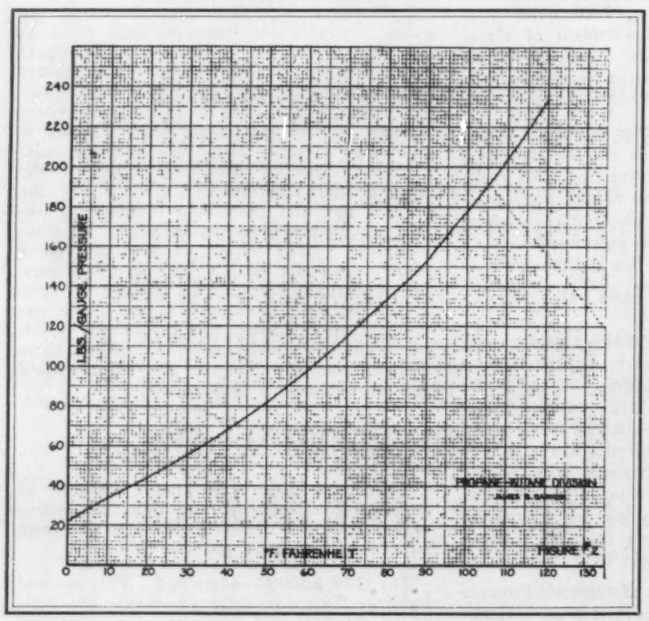
(a) In the production of the hydrocarbons;
(b) The provision of safe storage;
(c) Shipping containers and appliances;
(d) Loading and unloading of shipping containers;
(e) Transportation;
(f) Satisfactory pumps and compressors; and
(g) Efficient methods of transfer and distribution around local plants to points of utilization.

Many executives of public utilities have expressed curious fear that the use of these hydrocarbons in air or other inert gas dilution plants may result in troublesome condensation or drip problems. The following curves, showing relationships of dew point—pressure—temperature—concentration of propane, normal butane and iso-butane, will be informative and helpful as well in alleviating these fears. By dew point is meant the temperature at which one of the constituents of a gaseous mixture will begin to condense.

Some executives and a few engineers have been concerned with the hazards which will attend the use of these liquefied hydrocarbon gases as raw materials in supplying gaseous fuel to the residents of villages, towns and cities. In case of leakage, the gases, *per se,* are physiologically non-poisonous; they have a distinct and characteristic odor, readily and easily detected. The gases do not stratify near the floor or in basements. They diffuse as all other gases do in any confined space. The explosives ranges of these gases are less extensive than those of any other commercial gases, and higher kindling temperatures are required to ignite mixtures of the gases and air. The gases do not have any corrosive constituents and are therefore without any action upon materials employed in production, transportation, or utilization. The use of these gases, therefore:

(1) Does not necessitate the introduction of a foul odorant;
(2) Unusual means of ventilation are unnecessary; and
(3) Hazards to life and property are minimized.

Fig. 7 graphically represents not only the inflammability limits of commercial gases, but also the extent of the hazards of their usage.



ANALYSIS OF

"Hopane"
1.33% ethane
98.67% propane

"S.O. Tane"
1.47% propane
56.83% isobutane
41.70% N. butane

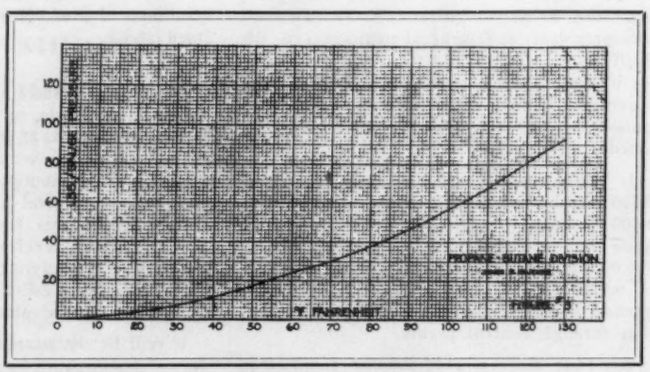


Fig. 2. "Hopane"

Fig. 3. "S. O. Tane"

Air liquefaction method—vapor pressure-temperature relationships for two commercial liquefied petroleum gases

Bugas has brought gas service within the reach of thousands of additional potential gas consumers, opening a vast field for development.

Western Gas is to be congratulated on its early recognition of the importance of liquefied gases in the present and future development of the gas industry.

Butane-Propane News will be an interesting record and of great assistance in this work.

+ + +

Natural Gas Corporation of California
Natural Gas Corporation of Washington
Natural Gas Corporation of Oregon

200 Bush St., San Francisco and Pacific Bldg. Portland

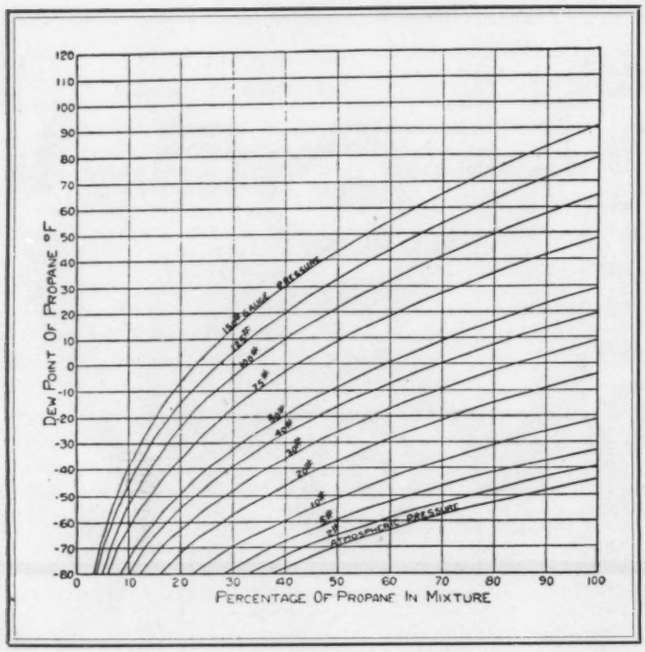


Fig. 4

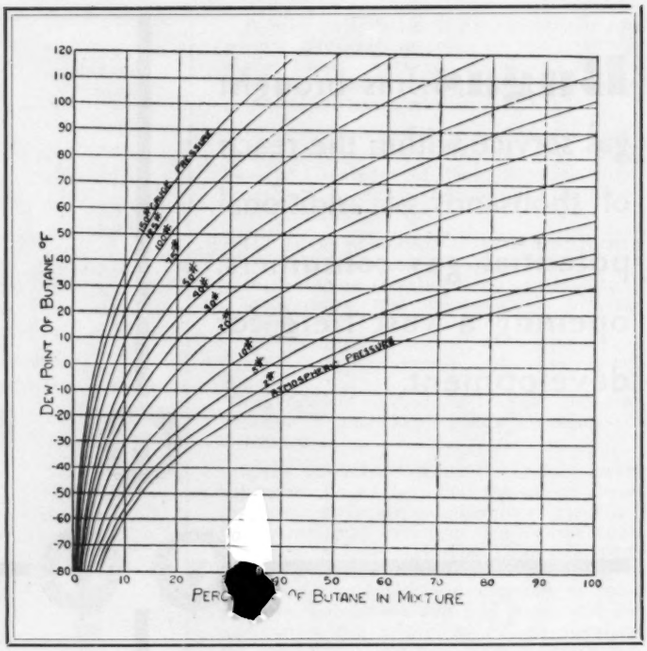


Fig. 5

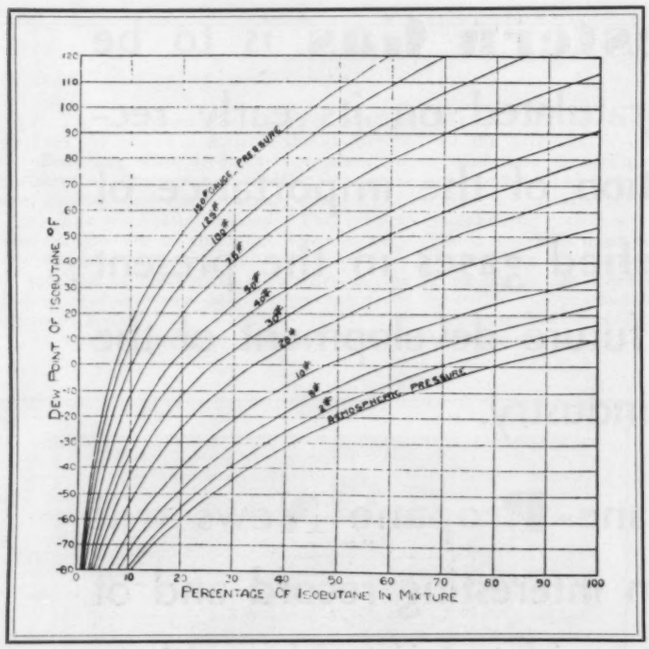


Fig. 6
(At Left)

From the viewpoints of sources of supply, methods of production, physical properties, and means of transportation and distribution, the geographic availability and continuity of service to consumers are assured.

Transportation and Distribution

Cylinders, tank wagons, tank cars, barge tankers and pipe lines are now utilized in the transportation and distribution of liquefied gases.

The cylinders in use are of various types, designs, and sizes. The most commonly used sizes are those having capacities of 40, 60 and 100 pounds of liquid. The so-called 40-pound cylinder is in extensive usage in the steel industry, wherein propane is transported to market and utilized in a highly efficient, safe, and satisfactory manner in steel cutting and pre-heating operations. The 60- and 100-pound cylinders have found extensive and satisfactory usage in the transportation of propane and butanes, as well as various mixtures of these, for use as domestic and minor industrial fuel gases.

Special tank wagons are used in several localities, noteworthily on the Pacific Coast, in making bulk deliveries to inland towns and cities not located on railroads.

Tank cars of two classes, designated by Bureau of Explosives as Class 104-A and Class 105-A-400, are generally and rather

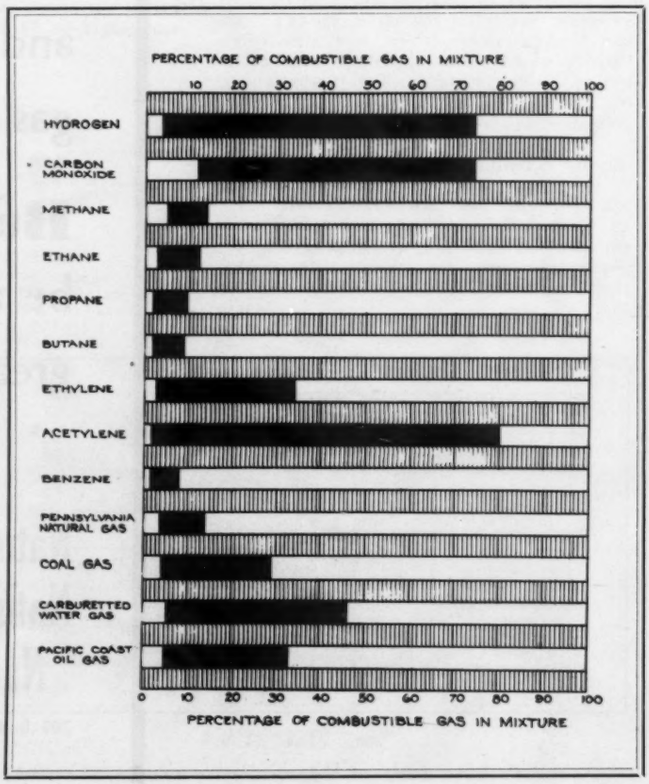
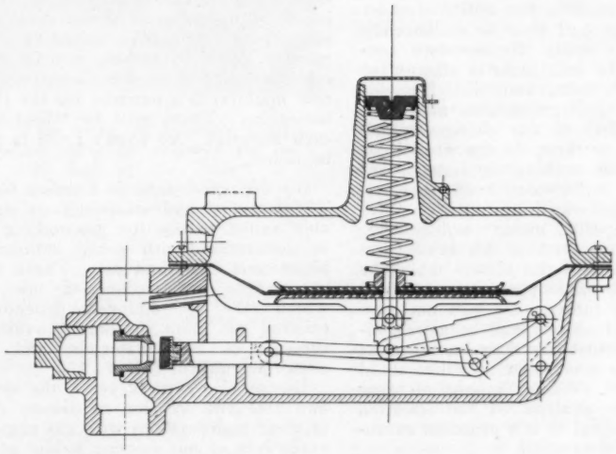


Fig. 7
(At Right)
Inflammability limits of gases

RELIANCE— "Type-H"— REGULATOR

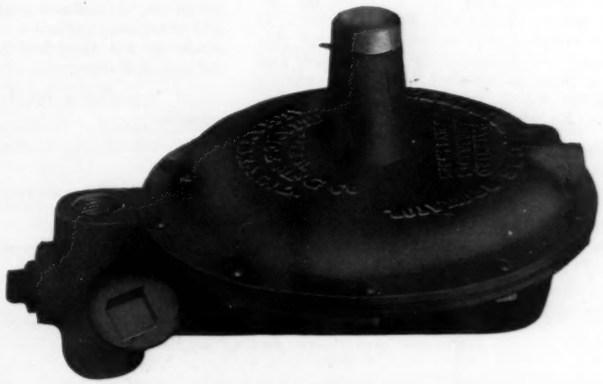


for

Butane-Air
Natural, and
Manufactured
Gases

Maintains uniform delivery pressures at extremely high rates of flow and has an exceedingly low lockup.

Valve and valve seat very accessible for inspection through handhole, easy spring adjustment for changing pressures.



Reliance Manufacturing Company, Alhambra, California

Northwest Gas & Electric Equipment Co.
Portland, Oregon
Westcott & Greis, Inc.
Tulsa, Oklahoma

Isbell-Porter Co.,
Newark, N. J.
Westcott & Greis, Inc.
Dallas, Texas

widely used in interstate shipments of butane and propane, respectively. By special approval of the Bureau of Explosives, the latter class of cars may be used for both commodities. These tank cars have an approximate capacity of 10,500 gallons of water and may be utilized in the shipping of, approximately, 10,000 gallons of both commodities. The actual amount in pounds which may be shipped is governed by the specific gravity, at 60° F., of the liquefied hydrocarbon and the water weight capacity of the car. The amount of butane which may be shipped is 54 per cent of the water weight, and the amount of propane which may be shipped is approximately 46 per cent of the water weight capacity. Both classes of tank cars have no bottom outlet. All of the loading, unloading, gauging and temperature measuring devices are located in the dome of the cars and are protected by heavy housing. The liquid and vapor lines are equipped with weighted check valves which seat upwardly. This safety provision eliminates the hazard of the escape of the contents of the car in case the valves or fittings are damaged or accidentally broken. The Standard Oil Co. of New Jersey, through its subsidiary, the Hope Construction and Refining Co., uses only one type of car, namely, the Class 105-A-400, for interstate shipments of both liquefied gases. The extra investment required is more than compensated for in the high safety factor and the elimination of outage losses. The safety valves on these cars are vapor-proof at 240 pounds per square inch, and open at a pressure of approximately 300 pounds.

Barge tankers are used in rare cases where rail facilities are lacking or advantage is taken of the lower water rates in making bulk delivery.

The pipe lines which are in use are small in diameter and of no great length. However, the time is not far distant when pipe lines will be used more extensively. Two such lines are contemplated. One of our large public utilities is giving the matter careful and constructive thought.

Uses of Liquefied Hydrocarbon Gases

(a) *Bottled Gas Service.* These two gases in cylinder form have value to the gas industry by enabling it to render service outside the area now covered by pipe line distributing systems, and thus increase the industry's sphere of activity and influence. It has been conclusively demonstrated that this form of service is eminently satisfactory, and that a very large number of people enjoy a convenience which would otherwise be impossible. Numerous, efficient, and beautiful appliances are available for all domestic purposes wherein these gases may be used. Several of the large public utilities have already planned to utilize these gases, by providing all the accessories entailed in rendering the so-called bottled gas service. There is no question about the advisability and the progressiveness of such a procedure. Public regard for the utilities will be enhanced, and when public good will is needed, in any utility expansion program, the cordiality of these mutual relations will constitute an asset. Failure to provide this convenient service is likely to constitute a liability.

(b) *As Raw Materials in Gas Industry.* A study of the physical properties, and some of the characteristic chemical properties of these hydrocarbon gases by technologists and engineers, will readily disclose the possibilities of utilizing these as raw materials in the gas industry, for the purposes of mass fuel gas production to meet the requirements of communities, towns, cities, and large industries. The practical executive will withhold judgment regarding the utility of these gases until he has had time to deliberately and constructively study the atendant economic factors. He will make a thoughtful appraisal of coal, coke, and oil. He will rehearse the history of gas-making materials, and study the effect of any changes which have been made in these, in the growth of the industry. Gas making appliances, retorts, generators, carburetors, ovens, holders, purifying systems, waste heat boilers, by-products, line deposits, meter troubles, etc., will race back and forth in his mind, and will more or less color the picture which he paints, and which he will use in comparing the past with the future. He will not dare to retrograde, and no one will be more conscious of his responsibility than he, when he reaches a definite conclusion to either stand still or go forward. We are hopeful of being able to make an analysis of the situation which will be helpful to this practical executive in moving forward.

The program of facilities, for production and distribution, as it has been developed, is in anticipation of a program of demands for economic consumption and utilization. There are certain well known factors which have been, and are now, used in determining the utility and economy of any commodity which may be used for fuel, or energy producing purposes. The following items must be given a definite value in any accurate and complete appraisal, or summarized valuation, of the liquefied hydrocarbon gases to the gas industry:

(a) Investment required in plant and accessories;

(b) Cost per unit of commodity to point delivered;

(c) Expense of operation and maintenance;

(d) Quality of commodity and finished fuel as distributed;

(e) Flexibility of use of commodity in meeting any unusual or peak load requirements of volume, heating value, etc.;

(f) Adaptability of commodity for specific uses:

(1) Where controllability of temperature is essential to effect uniform output;
(2) Where purity minimizes number of rejects, or increases yield per unit of gas consumed;
(3) Where processes of utilization are susceptible of automatic regulation, and hence, decreased labor cost;
(4) Where safety in utilization is of prime importance in eliminating hazard to life and to property.

A comparative and analytical study of the several appraisals, based upon the same items, of hydrocarbon gases, coal, coke and oil will be informative and will serve as a reliable guide in making conclusions. The cold facts will speak for themselves. No one raw material is a panacea for the ills of our industries. There will be "dead-lines" for each material. No Man's Land is certain to be found.

(c) *Liquefied Gases in Existing Gas Plants.* The liquefied hydrocarbon gases are admirably suited to use for gas-making purposes in connection with coke, anthracite coal, bituminous coal, and oil. There are many conceivable combinations of raw materials which may be employed, depending upon existing gas plant equipment, availability of supplies of raw materials, and delivered prices per unit of fuel.

During the past 12 years, the speaker has had frequent occasion to discuss the utility of these hydrocarbons with gas engineers and executives of our eastern public utility companies. The inquiries elicited have been of the following general substance:

(1) How may we use these gases in existing gas plants and distributing systems?
(2) How may these gases be used to advantage in small communities not now served with gas?
(3) How will the use of these gases affect adjustment in existing appliances? and
(4) What profits may be expected and what investments will be required?

It is unnecessary to remark that answers cannot be given to these four inquiries without study of each particular existing plant, the new communities to be served, the appli-

Fig. 8 (Below): Class 105-A-400 car, for transportation of liquefied petroleum gases. This type car is used by Propane-Butane Division of Hope Construction & Refining Co.

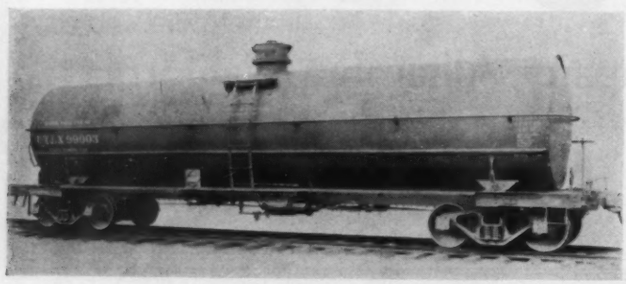
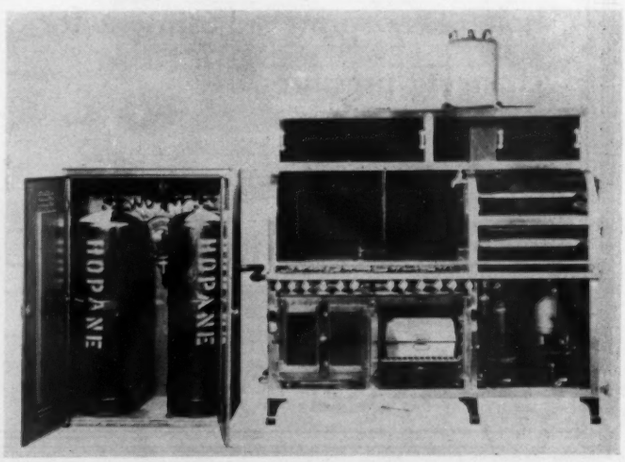


Fig. 9 (Right): A dining car installation, exemplifying the varied fields in which liquefied petroleum gases are finding application



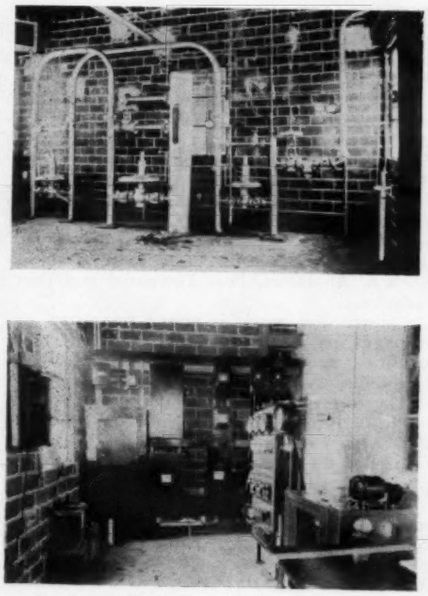


Fig. 10. Two views of Klamath Falls Ore., butane-air plant recently put in service for Natural Gas Corp. of Oregon. Section of operating room is shown in the upper view; control room, below.

ances which are in use, the profits which are now realized, and the investment actually carried.

In existing gas plants, both liquefied hydrocarbons have application for use as follows:

(a) As enriching agent, in place of gas oil or bunker oil, for blue water gas;

(b) As joint enriching agent, B.t.u. adjuster, and auxiliary fuel in old retort coal gas plants;

(c) As auxiliary fuel in meeting peak load demands of coal gas, carburetted water gas and mixed gas plants;

(d) As B.t.u. adjusting fuel to offset thermal losses due to compression, cooling, and transmission under high pressure.

No difficulties of any kind have been encountered in these uses of the hydrocarbons in the various plants. The economies which have been effected are noteworthy. There are some economic disadvantages, such as increased investment in liquefied hydrocarbon storage and for special equipment for the introduction of liquid hydrocarbons into the gas stream. There are no light oil or tar credits. There is a slight increase in the specific gravity of the gas, but not of such moment as to require re-adjustment of appliances.

The advantages more than offset the disadvantages. The hydrocarbons have a constant enriching value. There is 100 per cent thermal efficiency in use. There is flexibility in the use of these hydrocarbons to satisfactorily take care of peak and overload conditions. Light oils, naphthalene, gums or resins do not accumulate in mains or meters. There is no thermal loss in compression and cooling. The boiler fuel required is materially less. The expense of maintenance, purification and operation are decidedly less. The capacity of retorts, generators and other gas-making equipment is increased.

(d) *As Exclusive Raw Materials in Gas-Making.* There are approximately 2,000 communities in the United States, with population in excess of 1,500, in which the citizens have not enjoyed the cleanliness, convenience, and comfort of gas.

There are 355 communities—all over 1,500 population—in the New England States, which do not have any gas service. Out of a total population of 8,300,000 in the New England States, only 6,410,000 are now served with gas. Using a liberal ratio (11 to 1) of population to consumer, based upon the years of experience of the public utilities, there are 167,200 possible consumers in the New England States who are willing to pay for gas service, if it is available. An average consumption of 30,000 cubic feet per year per consumer would amount to an additional gas load of about 5,000,000,000 cubic feet. These figures demand serious reflection and consideration.

Within the past three years, 100 or more of such communities have granted franchises for the installation of butane-air, straight butane, or straight propane gas plants. More than 50 butane-air plants are in successful and satisfactory operation condition. Twenty additional plants are in course of construction. Two straight butane vapor plants and one propane vapor plant are in satisfactory and successful operating condition. Two additional butane vapor plants are under construction. Many of the large utilities have assigned their engineers and executives to a critical study of these developments and their probable application to the solution of problems such as high holder costs, antiquated plant replacements, new community installations, gas service extension plans, and the general antipathy of the public to the use of electricity for cooking and heating purposes.

The facts relative to the use of these hydrocarbons as a sole source of gas-making materials are impressive. Investment in plant is small; operating and maintenance charges, low. Operation is entirely automatic and exceedingly flexible. There are no purification costs; no line condensates, or meter troubles. The consumers are satisfied with the service. The rates are equitable. The possible return on investment is attractive. There are no unusual problems involved, or safety measures required. Of particular interest in this connection is an installation completed less than one month ago at Klamath Falls, in the State of Oregon. (Fig. 10). Temperature conditions during the initial days of operation were around 0° F. No difficulties of any kind, due to this low temperature, have been encountered. The Oregon plant was constructed by, and in accordance with, the designs of Thebo, Starr and Anderton, Inc., of San Francisco. The plant was installed for Natural Gas Corp. of Oregon, a subsidiary of the Standard Oil Co. of California.

(e) *Reformation Processes.* Probably the most significant and remarkable development in the use of liquefied hydrocarbon gases as raw materials for gas-making purposes is in the reformation of these gases in water gas generators. The Bureau of Mines in its Reports of Investigations, Nos. 2973 and 2991, has shown, by series of elaborate experiments, that this reformation can be effected with high thermal efficiency. Quoting therefrom: "The chief variables influencing operating results have been studied and methods of control are well understood. . . ." The finished gas which is produced has, substantially, the same properties as the gas now distributed by our large utility companies.

All of the standard equipment in a carburetted water gas plant is used, excepting the carburettor and the super-heater, and these are not required. The experimental results of the Bureau of Mines have been more than confirmed in the large scale production of reformed oil gas in the plant at Chester, Pennsylvania. The Chester plant is satisfactorily operating in the production of a gas comprising a mixture of approximately 50 per cent water gas and 50 per cent reformed refinery gas. This gas is made to a 530 B.t.u. per cubic foot specification, and has a specific gravity of approximately 0.50. The method of operation of the process is essentially the same as in the normal blue water gas process, but in addition, each steam up-run through the fuel bed is followed by an up-run through the fuel bed of straight refinery gas. This procedure results in an average gas of approximately 425 B.t.u. per cubic foot, and a specific gravity of 0.45. The "made" gas is then enriched to the desired B.t.u. value, by direct addition of refinery gas. This enrichment normally increases the specific gravity of the gas to about 0.50. In the Chester plant, the production of 1,000 cubic feet of 530 B.t.u. gas requires approximately 300 cubic feet of 1,600 B.t.u. refinery gas, and 10 pounds of coke, as generator fuel—90.3 per cent thermal efficiency. The carbon "cracked" from the refinery gas remains largely in the generator fuel bed and is consumed as fuel during the blow. No operating difficulties have been encountered, and the process seems admirably applicable to the utilization of liquefied petroleum gases, in conjunction with the operation of an ordinary blue gas generator.

To effect the use of larger quantities of propane and butane than are possible by straight dilution with blue gas, it is necessary to subject these gases to some special treatment which will reduce their heating value with an accompanying increase in volume (2.5 to 1.). This can be done by cracking the heavier hydrocarbons into lighter hydrocarbons and hydrogen.

The tabulation of approximate gas analytical data, given in Fig. 11, is strikingly interesting:

Constituents	*Blue Gas*	*Reformed Gas*	*Enriched Mixture*	*Carburetted Water Gas*
Oxygen	0.8	0.7	0.7	0.5
Nitrogen	6.8	3.9	5.9	2.9
Carbon Dioxide	4.5	0.5	2.5	3.0
Carbon Monoxide	39.8	0.5	20.6	34.0
Illuminants	.....	2.2	1.3	8.9
Hydrogen	47.1	62.6	49.5	40.5
Methane	1.0	29.6	16.3	10.2
Butylene	.....	.....	3.2	.....
Total	100.0	100.0	100.0	100.0
B.t.u. per Cu. Ft.	285	600	530	550
Specific Gravity	0.4	0.5	0.50	0.62

Fig. 11. Approximate Gas Analytical Data

It will be noted that the analysis of the enriched gas mixture is similar to that of ordinary carburetted water gas analysis, but contains somewhat more hydrogen and methane, and somewhat less of the total higher hydrocarbons, including illuminants, than is usual.

A careful study of the economic features involved in this method of use of liquefied hydrocarbon gases will, it is believed, fully warrant some of the large gas companies in adopting this method of gas manufacture as standard procedure.

Utilities G. & E. Butane Gas System

THE Utilities Gas & Electric Co., one of the pioneers in development of butane gas distribution systems, has an active development program under way for the current year. Its present distribution properties, and its immediate field of expansion, are graphically indicated in the map above. The Utilities Gas & Electric headquarters in Chicago.

Nine wholly owned subsidiaries operating in Minnesota, Wisconsin, Illinois, Kentucky, Tennessee, North and South Carolina, and Georgia make up the operating system of the company. The grouping of cities within these states is ideal from a management and operation standpoint.

At this time the Utilities Gas & Electric Company through its subsidiaries is serving a population of 130,000 people in 16 cities. With the franchises now owned and those pending, the foundation for a strong public utility gas system in 60 cities has been accomplished. The average population in these cities is 6,000.

In the 16 communities now being served the company has over 2,500 services installed. A conservative estimate in the various cities indicates that by July 1 this year the company will have an increase of over 100 per cent in consumers.

The company was organized as a public utility holding company in July, 1929, by Byron T. Gifford, who formerly organized and, as president, operated the Federal Public Service Corp., which is now owned by H. M. Byllesby & Co.

"New Meter Handicap" Contest for Natural Gas Properties

A "new meter" handicap contest was recently inaugurated in the Imperial Valley and Vacaville groups of the Natural Gas Corp. of Calif., of San Francisco, Calif., serving air-butane gas in several towns and cities in the state.

There are six entries in the contest—Vacaville, Suisun-Fairfield, Rio Vista-Isleton, El Centro, Brawley and Calexico.

The primary object of the contest is to increase the number of consumers in the territory where plants have been in operation for the past several months, and several valuable prizes have been offered.

Eight New Stores in No. West Butane Area

THIS month has seen the opening of eight new gas appliance stores by subsidiaries of Natural Gas Properties, Inc., in the Northwestern territory where gas is now being served by this company through the development of air-butane gas plants.

These stores were opened by Natural Gas Corp. of Oregon in Bend, Coquille and Cottage Grove, Oregon, with Natural Gas Corp. of Washington opening five more—Camas, Shelton, Anacortes, Port Townsend and Port Angeles.

Construction work is either completed or nearing completion in each of these communities, and much interest has been taken in the displays of gas appliance merchandise.

The stores are opened under the direction of T. E. Bartlett, manager of sales for Natural Gas Properties, Inc., and then put in charge of the local representative of the company in each community.

The following have been appointed as managers in the towns named: E. Quinby, Shelton; J. E. Plaisted, Camas; W. E. Berry, Skagit Valley District, all in Washington; and Harry Millikan, Cottage Grove; Ward D. Hopkins, Bend, Ore. Mr. Hopkins takes the place of L. R. Brown.

Conducting Research on Containers

A sub-committee of the Compressed Gas Manufacturers' Association, New York, is now working upon a draft of regulations for design, installation, and construction of containers and appurtenant equipment for the storage and handling of liquefied petroleum gases, in cooperation with other interested organizations.

Norfolk, Neb., May Have Butane Gas Service

Negotiations are under way between the Stewart Gas Co., Chanute, Kan., and the City of Norfolk, Neb., looking toward the application of a franchise for the service of butane gas in that town, according to Glenn A. Briggs, city clerk.

Straight Butane Now Served in Solvang

Santa Maria Gas Co., of Santa Maria, Calif., late in January, began operation of a straight butane plant in Solvang. The Union Oil Co. supplies the butane, produced at Orcutt and transported to Solvang by truck.

Plans Butane Installations

New York Power and Light Corp., Albany, N. Y., is reported to be planning the installation of several butane plants in its territory.

Butane Plant at Waupaca

The Central Wisconsin Gas Co., Madison, Wis, has recently put a butane plant in operation in Waupaca, Wis.

Applies in Lamar, Mo.

Dr. Herbert Smith, of Pittsburgh, Mo., has applied for a franchise to serve butane gas in Lamar, Mo.

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5. Bakelite Handles.
6. Oven full 14″ high, 16″ wide, 20″ deep.
7. Cast-Iron Front Frames and Legs.
8. Easily operated Cooking Top Cover.
9. Inverted Manifold—No sticking valves.
10. Door Springs below heat zone.

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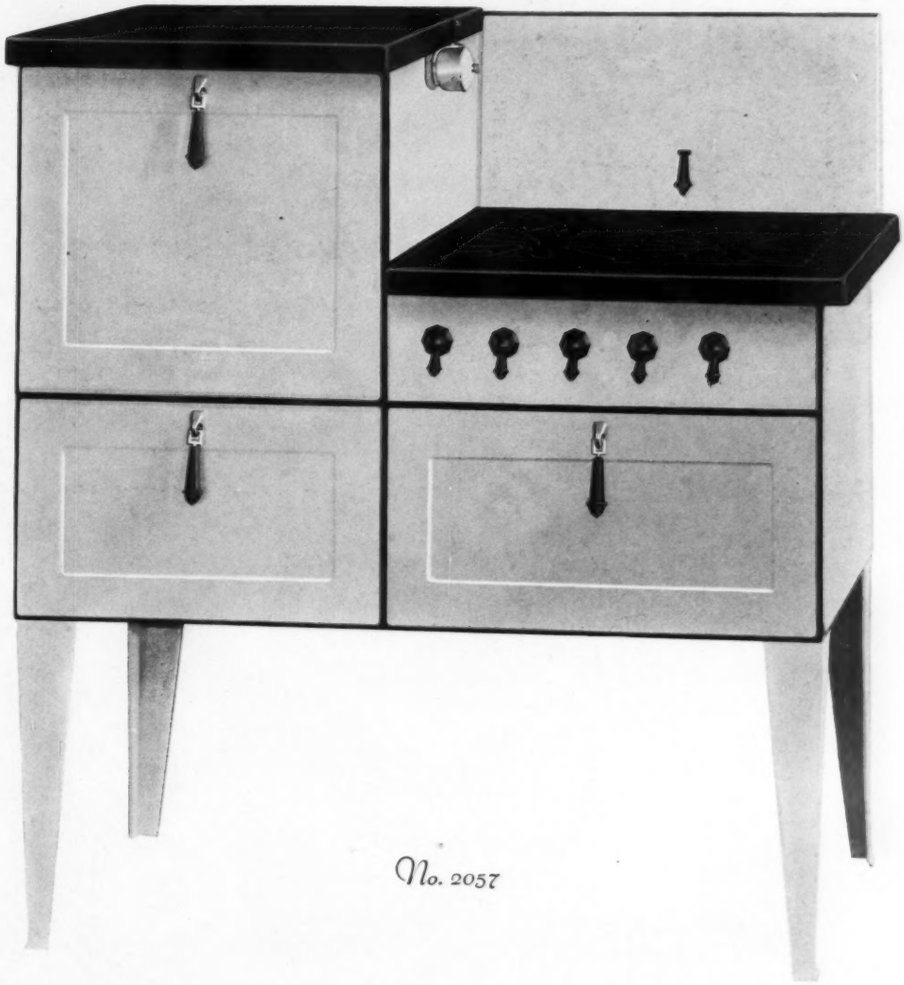
Unusual Features

11. Sturdy Base Construction.
12. Roomy Cooking Top.
13. Heavy Cast Top Grates—Porcelain Finish.
14. Four Dual Burners *(Conqueror)*.
15. Insta-Flame — No Matches—No Push Button Lighter — *(Conqueror)*.
16. Porcelain Oven Linings
17. Sani-Tray.
18. Sani-Grill.
19. Distinctive Finishes. Full Porcelain Enamel.



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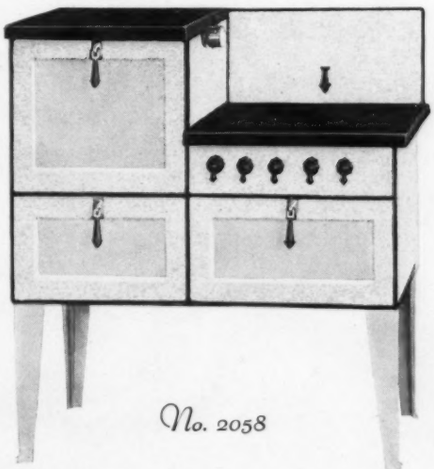

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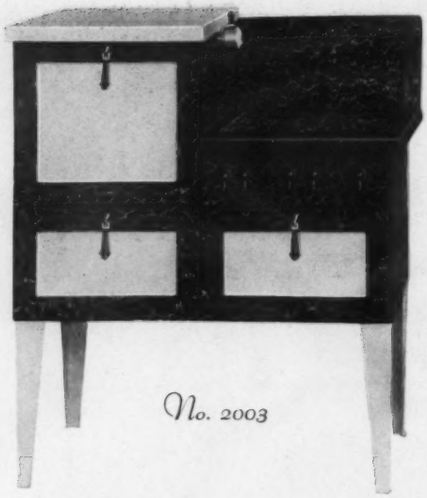
No. 2056

The Conqueror



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1. Full 14″ high oven, 16″ wide, 20″ deep.
2. Robertshaw Heat Control.
3. Construction features identical with *Conqueror* and *Cabineteer* models.
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7. Sani-Tray.
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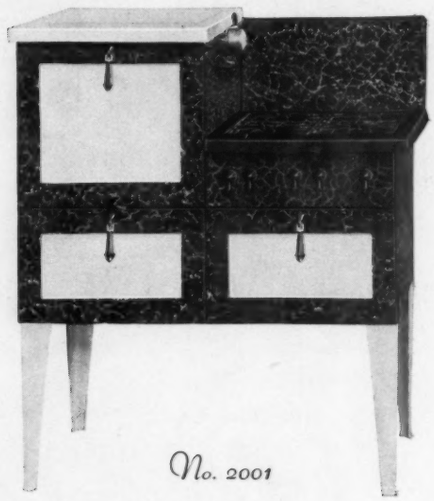
9. Porcelain Oven Linings.
10. Compact—39″ over all.



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BATTLE CREEK, MICHIGAN

Model kitchen exhibit featuring butane gas

Butane Demonstrated at Imperial Fair

AT the recent Imperial County Fair, Natural Gas Corp. of California maintained a "model kitchen" exhibit and demonstration, to sell the idea of butane gas for domestic service to the thousands of visitors during the week of the Fair. Miss Elner Martin, home economist of the company, was in charge of the exhibit, shown above.

R. E. Aitcheson, executive vice-president of the company, arranged for a special plane to take Governor James Rolph of California from Mills Field, San Francisco, to El Centro, where the Governor officiated at the opening of the Fair.

Natural Gas Corp. of California opened its butane service in Imperial Valley early last fall, and is meeting with much success in the development of these properties.

Mid-Continent Butane Franchising

SKELLY Oil Co., El Dorado, Kan., is conducting an aggressive franchising program for city plant butane-air gas service. Up to the present time the company has secured franchises in 38 cities and towns of the Mid-Continent area. The company is applying for permits principally in towns and cities of from 3,000 to 12,000 population. A plant was recently placed in operation in Spencer, Iowa, and construction is under way in other locations, among these being Anamosa and Audubon, Iowa. The plant at Spencer is serving about 200 consumers to date.

In addition to its company-owned franchises, Skelly Oil is supplying butane to 16 other plants located in various sections of the United States, such as Texas, North Carolina, and Wisconsin.

The company also distributes propane gas through the Skelgas Co., Inc., which conducts a regular cylinder distribution service for suburban and country homes, as well as furnishing cylinder propane for use in industrial operations. Activities of the company in this connection cover some 15 states in the Mid-Continent area, including Oklahoma, Nebraska, Iowa, Illinois, and Wisconsin. Skelgas consumers number approximately 15,000, and the total is increasing rapidly.

Both propane and butane are being distributed regularly in tank car quantities by the Skelly organization.

T. E. Bartlett Now Manager of Sales for Natural Gas Properties

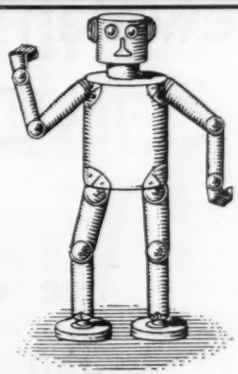
T. E. Bartlett, formerly commercial manager for Natural Gas Properties, Inc., will henceforth hold the title of manager of sales, his duties including the supervision of all sales for the three operating companies of Natural Gas Properties, Inc., Natural Gas Corp.'s of Oregon, California, and Washington.

First Butane Plant in N. Y.

The County Gas Utilities Co. has completed a plant for the service of butane gas in Fallsburg, Sullivan County, N. Y. This is said to be the first butane plant in the state for distributing liquefied petroleum gas.

Winslow, Ariz., Votes to Sell Municipal Gas Plant

The city council of Winslow, Ariz., has voted to sell the municipal gas plant to H. G. Laub, representing Chas. F. Stearn of Los Angeles, Calif., if the townspeople will grant a franchise for the service of gas to the purchasers. An election to decide the matter will be held shortly. It is understood that butane service is contemplated.



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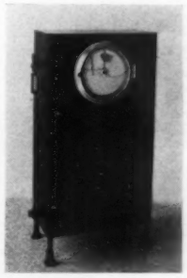

AC-ME GRAVITOMETER

This instrument is highly accurate. It records the specific gravity of natural and artificial gas every minute, and is especially indispensable where the gravity of gas is fluctuating, and particularly when gas is from different sources. This Robot is sensitive to all variances of gravity and allows for temperature and barometric changes. Put this mechanical man on duty. He is ruggedly built, requires but little room, and practically no attention. May we acquaint you further with the AC-ME GRAVITOMETER?

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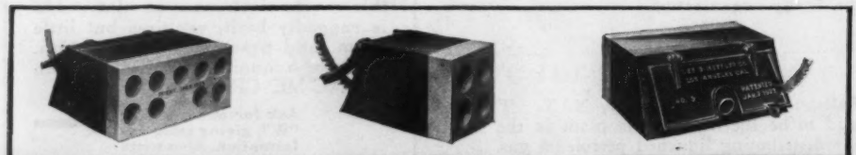

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Kinds of gas
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Wahpeton Gas Co. Is Completing Central Propane Plant

Construction of the gas plant and distribution system of the Wahpeton Gas Co. at Wahpeton, N. D., is rapidly approaching completion and gas will be turned into the lines in the near future, according to H. H. Henley, president of the Wahpeton Gas Co. Mr. Henley has been identified with the utilities operating in the Northwest for many years.

Twenty-five hundred fifty B.t.u. propane gas will be distributed in Wahpeton from a central storage tank. The Wm. Bros. Boiler & Mfg. Co., of Minneapolis is supplying the storage tank. Approximately 35,000 feet of main, exclusive of service connections, is being installed. The design of the plant has been worked out by Mr. Henley in cooperation with Philfuels Co., Detroit, Michigan.

"Bu-Gas" is New Name for Natural Gas Properties Product

"Bu-Gas" has been decided upon by Natural Gas Properties, Inc., as the name by which the liquefied butane gas handled by the company will be known.

This is in accordance with plans made by Standard Oil Co. of California, from which this liquid is purchased, for the use of a name which would be more representative of the product.

The liquid used is "Calol" liquid gas, or essentially liquid butane, but in accordance with the plans of Standard Oil Co. and Natural Gas Properties, Inc., this will henceforth be known as "Bu-Gas" in their properties.

Asks Franchise for Butane Service in Minnesota Towns

Texota Service Corp., subsidiary of Western Service Corp., has applied for franchises for the service of butane gas in Little Falls and Fergus Falls, Minn. C. A. Rogers is president and Charles F. Newsom is manager of the Texota company.

Mariclare Utilities Applies to Serve Kennett, De Soto

Franchises to construct and operate butane gas plants and distribution systems in Kennett, and De Soto, Mo., have been asked by Mariclare Utilities Co., which has headquarters at Pittsburg, Kan.

New County Franchises to Natural Gas Corporations

New county franchises have been granted to the Natural Gas Corp. of Calif. in Sacramento and Nevada Counties, and to the Natural Gas Corp. of Wash., in Skagit County.

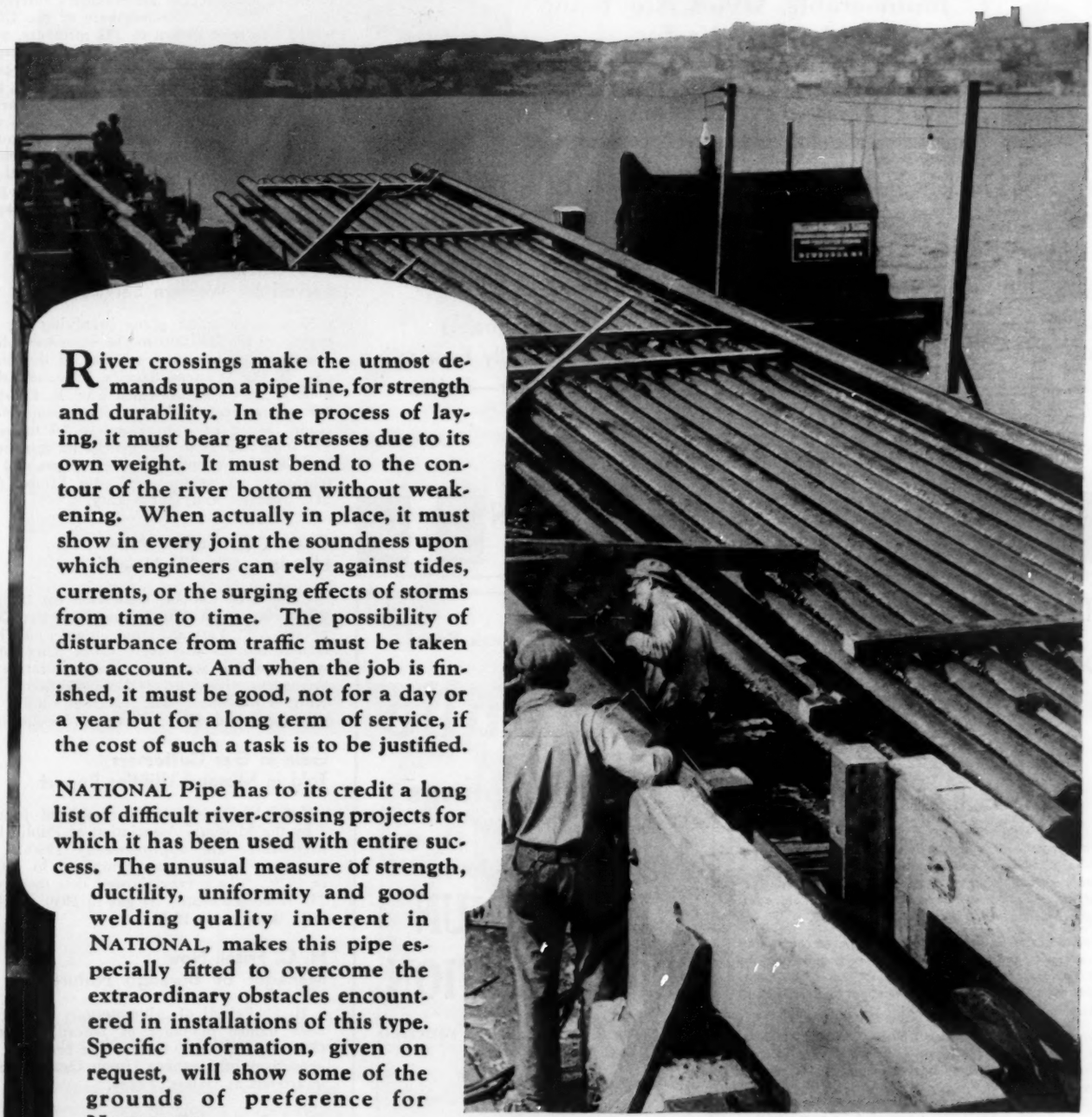
Oil and Gas Men in Golf Tourney

Three hundred oil and gas men of southern California were entertained at the Brentwood Country Club at Los Angeles, on February 23, the occasion being the club's third annual oil and gas golf tournament.

Reduced Rates at Perry, Iowa

Federal Public Service Corp., serving manufactured gas in Charles City and Perry, Iowa, has announced a reduction of its domestic rates at Perry.

BETWEEN THE SHORE LINES EXTRA SECURITY IS NEEDED



River crossings make the utmost demands upon a pipe line, for strength and durability. In the process of laying, it must bear great stresses due to its own weight. It must bend to the contour of the river bottom without weakening. When actually in place, it must show in every joint the soundness upon which engineers can rely against tides, currents, or the surging effects of storms from time to time. The possibility of disturbance from traffic must be taken into account. And when the job is finished, it must be good, not for a day or a year but for a long term of service, if the cost of such a task is to be justified.

NATIONAL Pipe has to its credit a long list of difficult river-crossing projects for which it has been used with entire success. The unusual measure of strength, ductility, uniformity and good welding quality inherent in NATIONAL, makes this pipe especially fitted to overcome the extraordinary obstacles encountered in installations of this type. Specific information, given on request, will show some of the grounds of preference for NATIONAL—

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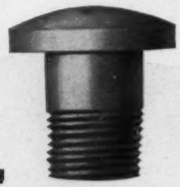

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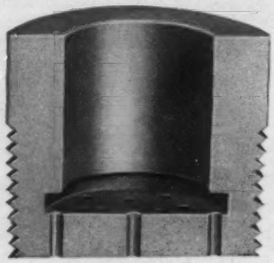

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For the work of reconditioning pipe lines the Dearborn Pipe Cleaning Machine, Jinnett Patent, does a more perfect job than hand labor at only a quarter of the cost. All dirt, rust and remains of old coatings are removed regardless of condition.

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Oil Equipment Exposition
March 16th - 22nd
Los Angeles

Portland Gas & Coke Co. Veterans Hold Annual Meeting

Six years ago the Portland Gas & Coke Co., Portland, Ore., invited all employees with a record of 10 years or more in the company's service to a dinner at one of the local hotels.

The meeting of the Veterans' Club has become an annual event, the company providing a banquet and an evening's entertainment. This year the members of the Club, which has now grown to 293 members, suggested to the company management, by means of a petition, that they forego the usual banquet and expense of outside entertainers and donate the money saved to local charity. The management accepted the suggestion and the annual meeting was held in the auditorium at the company's main office building. An excellent program was provided, entirely by employees, a light lunch served and a substantial check went to a local organization to help those in need.

Five Oklahoma Towns to Be Served by Western Service Corp.

New construction plans involving the expenditure of $250,000 in the state have been announced following a meeting of the directors of the Western Service Corp. of Oklahoma City, Okla., of which Earl R. Ernsberger is president. Proposed improvements include laying of approximately 50 miles of gas pipe line from the Chickasha gas field; building five community gas systems and extension of gas service to Tuttle, Minco, Amber, Pocasset and Union City.

Charles G. Cooper Now Headquartered in New York

Charles G. Cooper, associated for the past three years with The Cooper-Bessemer Corp. at its Mt. Vernon, Ohio, plant, has been transferred to the New York City office, where he will act as sales representative for the several divisions of the corporation. The New York office will continue under the management of C. M. Reagle, vice-president.

Gain in Gas Customers Told in Missouri Utilities Report

According to a survey completed January 1 by the Missouri Association of Public Utilities, there are approximately 396,674 gas customers in the state, compared to 390,730 in 1929. The survey showed that there were 23,747 homes heated by gas in 1930, while in 1929 there were 13,591.

H. C. Frizell Now Manager of Durango Natural

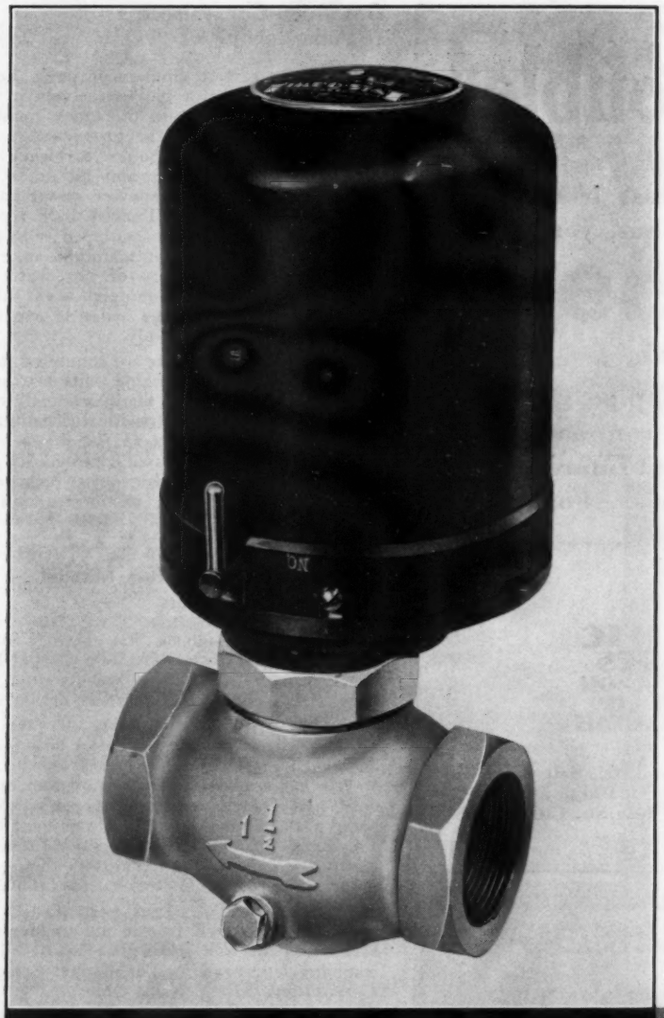
H. C. Frizell of Albuquerque, N. M., has been named manager of Durango Natural Gas Co., Durango, Colo. The company is a subsidiary of Southern Union Gas Co., headquartered at Dallas, Texas.

Clark P. Read Goes to Northern Natural at Omaha

Clark P. Read, general auditor for the Lone Star Gas Co., has accepted a post as general auditor of the Northern Natural Gas Co. and affiliated companies at Omaha.

Consumers Gas Co. Organized

The Consumers Gas Co., has been organized in Billings, Mont., for the purpose of distributing natural gas.

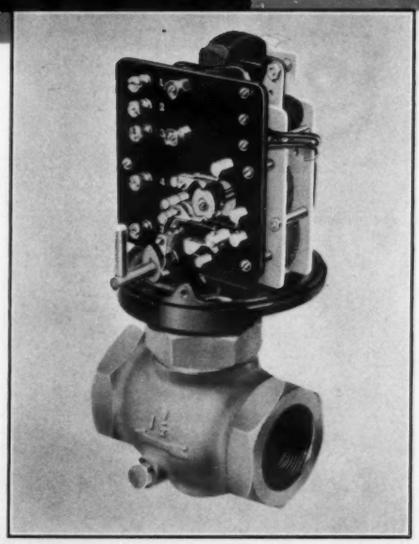


TIME-O-STAT'S ELECTRIC GAS VALVE

RUGGED construction plus distinctive operating features make *Time-O-Stat's* No. 580 Electric Gas Valve the ideal valve for all types of gas-fired equipment.

The separate transformer furnished means low voltage wiring for the entire control system and an easier, quicker and lower cost installation. The sturdy low voltage motor operates only when the valve opens or closes.

Oil-less gears and bearings in the No. 580 require no attention. The design of the valve eliminates overheating, and it is silent in operation. Write for literature on *Time-O-Stat's No. 580.*



The No. 580 closes automatically on power failure and is arranged for manual control. The valve operates against spring pressure and is not dependent on gravity.

Time-O-Stat's No. 580 Gas Valve is made in 1", 1¼", 1½", 2", 2½" and 3" valve sizes. Available in models equipped for secondary air damper control, and circulating fan control.

BRANCH OFFICES
NEW YORK
BOSTON
CHICAGO
EXPORT DEPARTMENT
NEW YORK

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

EXCLUSIVE DISTRIBUTORS IN ALL PRINCIPAL CITIES OF THE UNITED STATES.

CANADIAN DISTRIBUTORS TORONTO AND MONTREAL.

Manufacturers of Automatic Controls for Oil Burners, Gas Burners, Coal Burners, Electrical Refrigerators, Furnace Fans, Mechanical Stokers, Industrial Ovens, Ice Machines, Unit Heaters, also of Sign Flashers, Mercury Switches, Electric Heaters, Corrugated Metal Bellows

Lay Pipe—Not Trouble!

With advent of western-made cast iron pipe with high-pressure joints for gas, you can do just that.

Cast Iron Pipe CAN'T rust.

McWane-Pacific Joints CAN'T leak.

Combine the advantages of ALL pipe in ONE pipe—McWane-Pacific cast iron gas pipe—and end coating, coddling, and future trouble. Sizes 1¼ thru 12 inches. For prices, full data, list of western users:

McWANE CAST IRON PIPE CO. BIRMINGHAM ALABAMA

PACIFIC STATES CAST IRON PIPE CO. PROVO, UTAH

111 Sutter St., San Francisco
417 S. Hill St., Los Angeles
611 Spalding Bldg., Portland
149 W. 2nd South St., Salt Lake City
1807 Santa Fe Bldg., Dallas
208 S. La Salle St., Chicago
226 Continental Oil Bldg., Denver

FUEL ECONOMY

COMBUSTION EQUIPMENT LEAHY LOS ANGELES CAL. U.S.A.

The Cheapest fuel is the Best

LEAHY Dual Combustion Furnaces are equipped for both oil and gas. Either fuel may be used or both together. This fuel flexibility will be recognized by the Power Plant Engineer as a tremendous asset to boiler operation economy. With equally high efficiency Leahy equipment will handle whichever fuel is available, or the cheapest to burn. The Leahy gas burner is adaptable to burn either high or low pressure gas. The Leahy oil burner will thoroughly atomize any grade of fuel oil with a minimum amount of steam or air. One fuel may be changed to the other without loss of time or sacrifice of efficiency.

◆

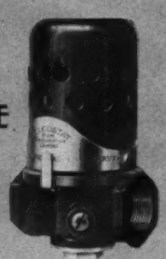
LEAHY MANUFACTURING CO
Established 1902
1804-1812 East Eighth Street, Los Angeles, California

E. A. CORNELY INC.
1452 Bush Street, San Francisco, California

The WILCOLATOR

OVEN HEAT CONTROL

The WILCOSTAT ROOM TEMPERATURE CONTROL



The WILCOLATOR Co. Newark N.J.

Gas Adds Convenience To Amusement Park

Portland's newest amusement park, Lotus Isle, is making use of gas extensively in the bath house as well as in the lunch counters and stands throughout the grounds. A 35-horsepower hot water boiler furnishes hot water for shower rooms and all other demands. A small 2-horsepower steam boiler supplies the steam and Turkish bath rooms. Both of these boilers are equipped with full automatic controls which maintain an even temperature and quantity of hot water or steam; also, they are equipped with safety devices which shut off the boiler in event of interruption of water supply.

In addition, a furnace is connected to a large dryer wherein bathing suits are hung to dry. The furnace is thermostatically controlled and operates automatically maintaining an even temperature in the dryer. All this equipment is being used continuously and has not been forced to shut down because of any mechanical trouble or interruption of fuel supply.

Cooper-Bessemer Offers Manual On Engine Indicators

A 34-page handbook has been brought from the press recently by The Cooper-Bessemer Corp. The book was written by Hewitt A. Gehres, chief engineer of the company.

The textbook explains in detail how to use and read an engine indicator on 2- and 4-cycle gas engines, and on compressor cylinders. How to determine compression pressure; peak pressure; terminal pressure; back pressure; ignition timing; valve timing; mixture conditions; prematures—these and many other points of correct operation are discussed.

A copy is offered free to any reader who states his title and sends the request on his company letterhead to The Cooper-Bessemer Corporation, Mt. Vernon, Ohio.

1930 Sales Show Increase Of 60 Per Cent Over 1928

Four score of Gas Service Co.'s new business managers and sales supervisors attended the annual conference of the department held at the Hotel Baltimore in Kansas City, Mo., recently. F. M. Rosenkrans, new business manager, announced that preliminary figures indicate that appliance sales for the company for 1930 will total $3,500,000, an increase of 60 per cent over 1928.

Western Gas Co. of Washington Building Holder

Construction has started on a 15,000-gallon storage holder and three high pressure tanks for the Western Gas Co. of Washington at Bremerton, Wash. Construction of the distribution system was expected to be finished by the middle of February. L. M. Longan, Longview, Wash., is manager, the company being a subsidiary of the Public Utility Investment Co., of Salina, Kan.

Mitchell, South Dakota, Scheduled for "Natural"

Northwestern Public Service Co., Mitchell, S. D., is anticipating serving natural gas in that town through an extension from the Texas-to-Chicago line. The company is now serving manufactured gas in Mitchell.

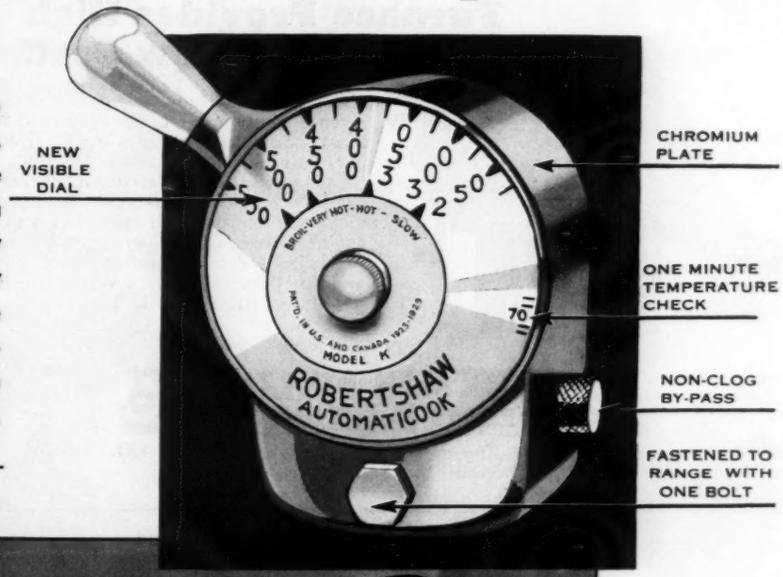
Creating NEW customers for you

BY CONSISTENT ADVERTISING in the foremost national publications, American housewives all over the country have been educated to *insist* on having a gas range that is Robertshaw equipped. And that means a *new* range, for the Robertshaw cannot be sold separately. More than 140 popular brands are now made with the Robertshaw as standard equipment.

It's smart selling strategy for you to demonstrate the Robertshaw as often as you can. Show the housewife how this simple, trouble-proof, neat appearing device gives her automatic and controlled cooking. Make her realize what it means to get away from the kitchen for hours and hours of new freedom, new sociability.

Keep in touch with the great advertising drive. See the campaign this spring. Be sure that your salesmen and service men also know the manifest advantages of Robertshaw cooking. Just send us their names and we will place the Robertshaw story throughout your organization.

ROBERTSHAW
THERMOSTAT COMPANY
YOUNGWOOD, PENNA.

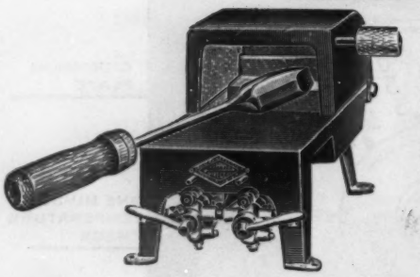


ROBERTSHAW
AutomatiCook

For Soldering and Soft Metal Melting!

The JOHNSON No. 8 Torch and Melting Pot is a unit which enjoys wide popularity among men who work with metals. The many uses to which this efficient, inexpensive tool may be put are explained in our free catalog. Write for it!

This JOHNSON Bench Furnace Provides High Efficiency at Low Cost!



Two powerful Bunsen Burners supply intense heat without use of forced air blast. Soldering coppers up to 12 lbs. per pair may be heated quickly by means of this widely-used furnace. Correct design insures maximum efficiency at minimum cost. Also used for heat-treating, tempering, annealing, or case-hardening carbon steel tools and small metal parts. Write for full details on the No. 101.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.

GROBLE
REGULATORS & GOVERNORS

Complete Line of Regulators for

Natural, Manufactured, Butane and Propane Gas

Pacific Coast Representative,

T. G. ARROWSMITH COMPANY,
661 Howard Street San Francisco, Calif.
Phone Garfield 8419

GROBLE GAS REGULATOR COMPANY
Office and Factory: Anderson, Indiana

TAPPAN

Supremacy

is not a newly-won achievement, but an old and accepted standing in the eyes of gas appliance men and the public alike. No other gas range combines so many outstanding superiorities into such a perfect whole—the TAPPAN Insulated Oven gas range.

H. R. Basford Co.
665 Howard St.
San Francisco

H. R. Mayer
1001 E. 1st St.
Los Angeles

F. W. Schwab
2512 N. Stevens
Tacoma

Guthrie, Okla., May Cancel Bonds for City Owned System

Guthrie, Okla., which last June voted $225,000 in bonds to establish a municipally owned natural gas distribution system, has called an election for March 23, to vote on a proposal to cancel these bonds and issue a natural gas franchise to the Western Service Corp., of Oklahoma City, of which Earl R. Ernsberger is president and general manager.

Validity of the Guthrie municipal gas bonds is questioned in a suit now pending in the Oklahoma Supreme Court and the possibility of a long delay in securing a determination of this action was one of the contributing factors in causing the city council at Guthrie to favor submission of the gas franchise and the bond cancellation proposals.

H. C. Beaver New Vice-President Of Worthington Corporation

H. C. Beaver, formerly executive vice-president of Rolls-Royce of America, has accepted a post as vice-president of the Worthington Pump and Machinery Corp., New York, as announced at the annual sales meeting of the company held in Harrison, N. J., on February 9. Mr. Beaver devotes his time principally to the administration of the sales department.

E. E. Yake was advanced at the same meeting to the office of vice-president to direct manufacturing and engineering.

Another Transmission Line to Serve Wagoner, Okla.

The Cherokee Public Service Co., Muskogee, Okla., is constructing a 4-inch natural gas pipe line from the Atchison North lease near Wagoner, Okla., to connect with its central pipe line system, which carries gas to that city. The Wagoner Gas Co., a subsidiary of the Cherokee Public Service Co., distributes gas in Wagoner and now secures its gas from three sources, the lines of the Oklahoma Natural Gas Corp., the Southwestern Natural Gas Co., and the Cherokee Public Service Co.'s lines from Wagoner and Muskogee County fields.

Reduction of Rates in Bisbee-Douglas Territory

Arizona Edison Co., headquartered at Phoenix, Ariz., has announced a reduction of gas rates in the Bisbee-Douglas area. The minimum rate is reduced from $1.90 to $1.80 for the first 1,000 cubic feet. The next 3000 cubic feet is reduced from $1.80 to $1.60, while the next 5,000 cubic feet is reduced from $1.70 to $1.40. All over 10,000 cubic feet will be charged for at a rate of $1.20 per thousand instead of $1.60 per thousand.

New Record for Natural Gas Output in Canada

Natural gas output set up a new high record in 1930 in Canada; 29,565,000,000 cubic feet, valued at $10,561,000, were produced. Wells in Alberta accounted for 69 per cent of the total Canadian production.

More Franchises to Mid-West Co.

Madison, Wayne and Valley, Neb., have each granted the Mid-West Natural Gas Co. a franchise for the service of natural gas.

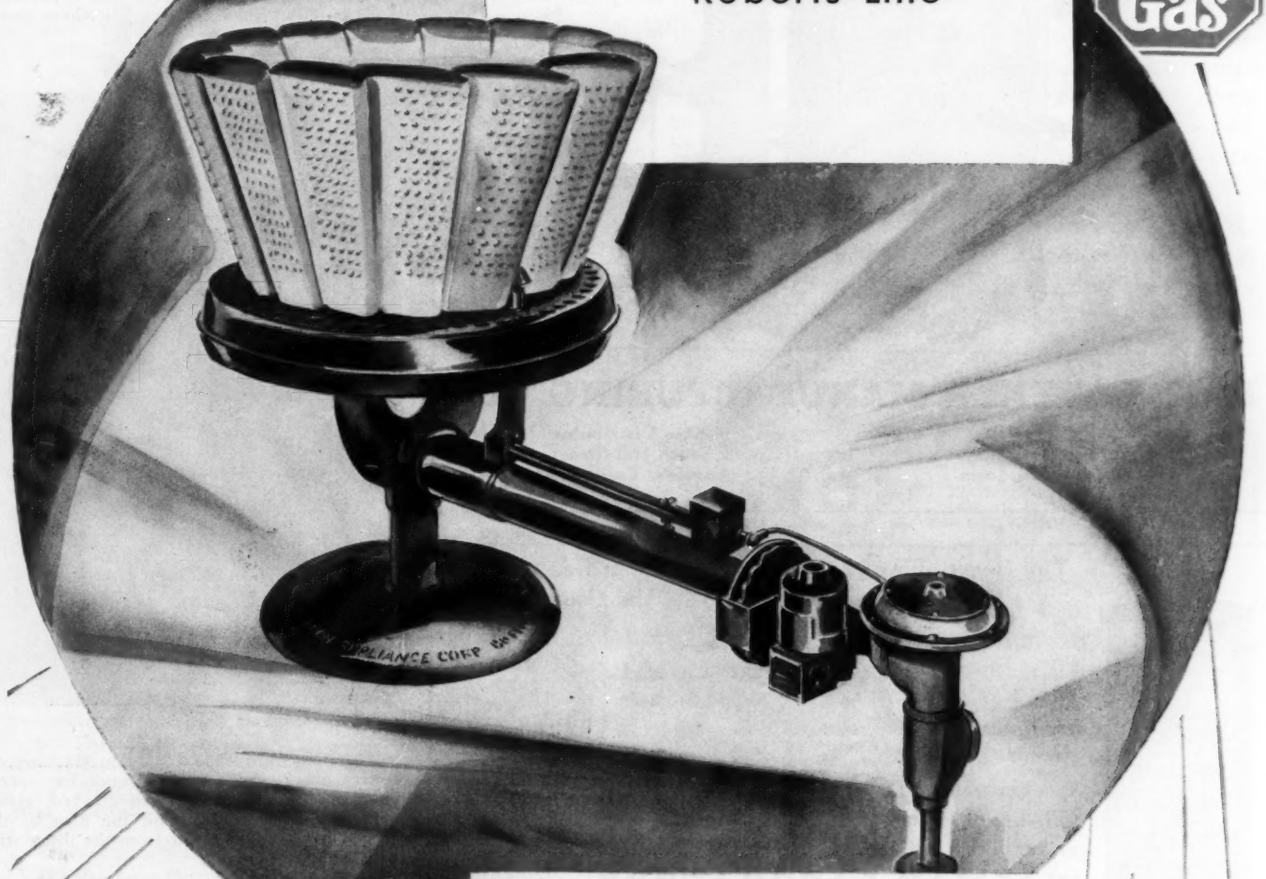
Adds to Personnel

The Joplin Gas Co., Joplin, Mo., has appointed B. F. Mayer to direct public relations work for the company.

The Roberts *Junior*

Completes the Roberts Line

Heat YOUR HOME with Gas



THE Roberts *Junior* Burner was designed and built as a companion to the Roberts Standard Burner. *It Completes the Roberts Line.*

The Roberts *Junior* Burner meets the demand for a quality burner at a price within the reach of the modest pocketbook.

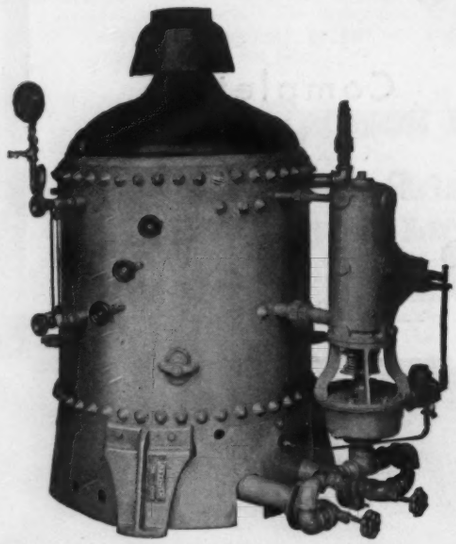
Learn the full story of the Roberts *Junior*. Gladly will we send full information without the least obligation.

ROBERTS-GORDON
APPLIANCE CORPORATION
CURTISS BLDG. BUFFALO, N. Y.

ROBERTS
CONTROLLED
GAS HEATING UNIT

Automatic Gas Fired Boilers

LATTNER



All Sizes from ½ to 30 H. P.

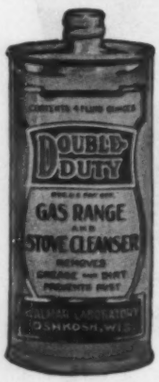
All Pressures.

P. M. LATTNER MANUFACTURING CO.

Factory
516 12th Avenue
Cedar Rapids, Iowa

Warehouse Distributor
2646 South Hill Street
Los Angeles, California

The Heart of Any Home Is the Kitchen Gas Stove
Keep It Bright and Clean By the Use of



Removes Grease

DOUBLE DUTY
REG. U.S. PAT. OFF.

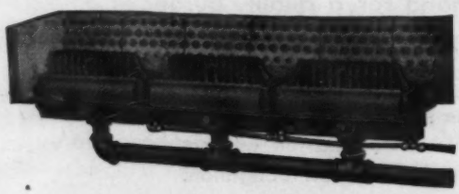
Prevents Rust

GAS RANGE & STOVE CLEANSER

WALMAR LABORATORY Oshkosh, Wisconsin

Western Distributor
C. B. BABCOCK CO., San Francisco, Los Angeles

R. M. C. Gas Burner



Durable Safe Economical

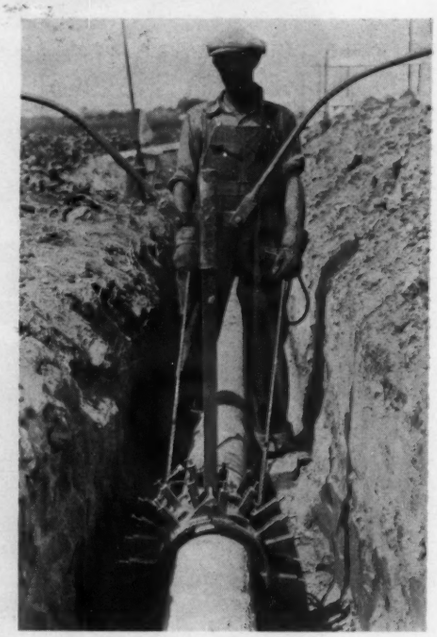
ROTARY MANUFACTURING CO.

5720 Long Beach Avenue Los Angeles, California

Dearborn Pipe Cleaning Machine, Jinnett Patent, On Market

The Dearborn Chemical Co. has recently announced perfection of the Dearborn Pipe Cleaning Machine, Jinnett patent. This device effects a saving over hand cleaning methods of 50 to 75 per cent, according to the manufacturer.

The Dearborn Pipe Cleaning Machine, Jinnett patent, removes the dirt, dust, and old coatings, and frees itself from the dirt and deposits removed from the pipe. In order that the cutting tools may be kept sharp and in proper adjustment, an extra set of cutters is recommended by the manufacturer. These cutters may be sharpened on an ordinary emery wheel, and a portable outfit is recommended on the job where much cleaning is to be done.



The Dearborn Pipe Cleaning Machine requires about an 8-inch clearance for operation and permits pipe to be cleaned, either when elevated 8 inches off the floor of the trench or when removed from the ditch with similar clearance.

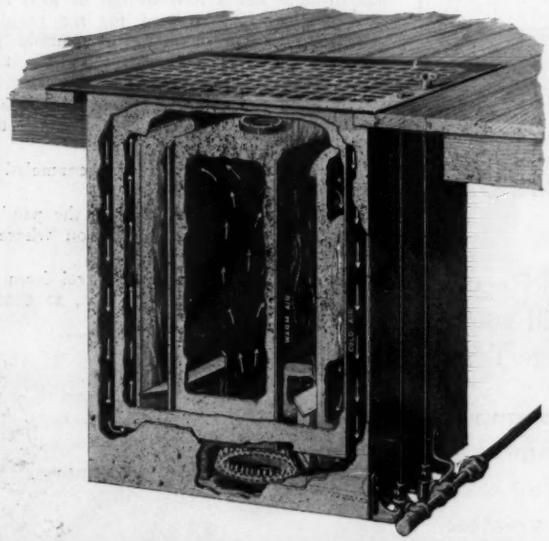
One man drags the cleaner along the pipe, while the rotary cutting motion is provided by alternate pulls against the vertical lever in much the same motion as two men handling a cross-cut saw. The machine opens and closes with the same motion as a pair of tongs, and hence may be passed over welds, collars, etc.

Detailed information will be submitted by the company, 310 S. Michigan Avenue, Chicago, Ill.

January Gas Sales Southern Natural Gas Corp.

For the first time, monthly sales of gas by Southern Natural Gas Corp., Birmingham, Ala., reached and exceeded one billion cubic feet in January. The corporation reports that its deliveries of gas in January amounted to 1,210,215,000 cubic feet, as compared with 835,067,000 for December, an increase of 375,148,000 cubic feet, or about 45 per cent. The January total not only set a new high record but showed the largest monthly gain in volume yet reported.

REPLACE . . . *DON'T REPAIR*



that Defective Furnace

There's more money for you, better service for your customer, in a brand new PACIFIC FLOOR FURNACE. It will take no longer to install it than it would to repair an old furnace or other heating system, and you have paid yourself a real profit and done your customer a real favor.

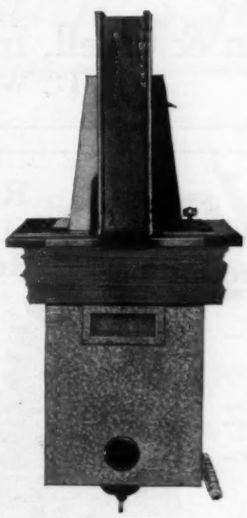
Winter weather shows up defective heating systems. Now is the time to sell Pacific Floor Furnaces and other modern Pacific Gas Appliances. Their first cost is moderate; they are economical to operate; they deliver the heating comfort your customers want.

THERE'S MONEY, RIGHT NOW, FOR YOU in a Pacific Gas Agency. Write today for full details, including the Pacific Sales Helps that really sell.

Features that Make this Furnace Better, and Easier to Sell

1. Floor or wall registers in antique bronze or brushed brass finish.
2. Five large heat radiating surfaces (four sides and top) utilizing all heat in gas.
3. New method of casing construction, exclusive with Pacific, keeps casing cool at all times, and insures abundance of air to heating chamber for reheating. **There is no heat loss through outer casing.**
4. Heating unit of 20-gauge pure ingot iron. Pressed and welded joints are absolute insurance against leakage. Extra heavy cast iron dome superheats air before it passes into room.
5. Raised-tip Bunsen type burners, with clean-drilled flame holes and soapstone tips. Long heat travel of burned gases and indirect method of venting allow hot gases to come in contact with greater radiating surface than possible in other designs.
6. Three sizes, to meet the needs of any type or size of building.
7. Adaptable to any type of modern electric or hand control.

Our Agency Proposition is Attractive . . . Write for Particulars on Your Locality



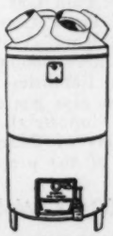
THE PACIFIC DUAL SYSTEM

Identical in quality and construction with regular Pacific Floor Furnace, but has two registers. Delivers heat into two rooms at once, or may be used in either room alone. Every Pacific Furnace is fully guaranteed in every detail of material and workmanship, with nearly 20 years of reliable dealing behind the guarantee.

Pacific Gas Radiator Company

Gas Heating **Headquarters**

Gas-Steam Radiators


Round Furnaces

Roseberry and Walter Streets
Huntington Park California

Dual Pipeless Furnaces

Fireplace Radiant Heaters

Recess Radiant Wall Heaters

Automatic Storage Hot Water Heaters

Pipeless Floor Furnaces

Gas Radiators—Pressed Metal and Cast Iron

Agencies Throughout the West

Call for a Pacific Heating Engineer

MANUFACTURERS *of* EVERY TYPE *of* GAS HEATING APPLIANCE

PLAY SAFE!

By Specifying and Using

"COLONIAL" BRAND

Re-Chrome Meter Leather

BESSE, OSBORN & ODELL INC. · COLONIAL · BRAND · BOSTON, U.S.A. · RE-CHROME METER LEATHER

in your New Meters and Repair Work. This Leather will stand the Five-Minute Boiling Test.

This Trade Mark stamped on each New Zealand Lambskin is our guarantee to you that each skin has received the greatest care in its selection and tanning.

Besse, Osborn & Odell, Inc.

51 South Street, Boston — 177 William St., N. Y.

Reynolds
Gas Control Since 1892

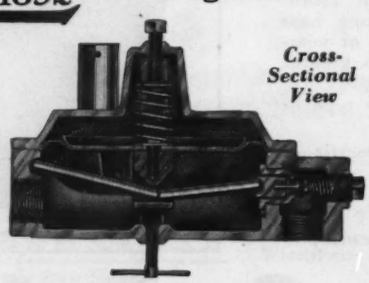
Reynolds Little Giant Regulator

Products for all kinds of Pressure Reduction—for either artificial or natural gas.

GOVERNORS—Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.

REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.

VALVE—Automatic Quick Closing Anti Vacuum.



Cross-Sectional View

Reynolds Gas Regulator Company
Anderson, Indiana

FORNEY

COMBINATION GAS and OIL BURNERS

For Power Plant and Industrial Uses

Write for Literature
and List of Installations

FORNEY COMBUSTION ENGINEERING CO.

513 CENTRAL BANK BUILDING, DALLAS, TEXAS

New Wilcolator Temperature Control Device

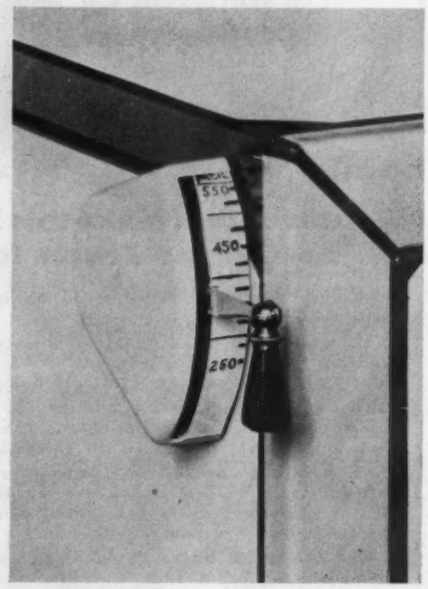
THE Wilcolator Co., manufacturer of heat controlling devices, Newark, N. J., has brought out a new design of heat control, particularly designed for the requirements of the newer type of console gas range. The notable features of the new Wilcolator are as follows:

The temperature indicator and zone chart is visible from the front of the range and in a convenient position.

The control casing can be enameled to match the range color.

The heat control handle is of the pendant type and is located in a position where it remains cool.

The extension of the heat control from the side of the oven is only 1 inch, so that it



does not interfere with normal operation of the cooking top. The use of porcelain enamel on the temperature indicator and the heat control casing allows it to be easily cleaned.

Cold calibration can be made if the temperature indicator is calibrated down to below room temperature. The minimum flame adjustment is in a convenient position below the casing, although not visible when the range is in use.

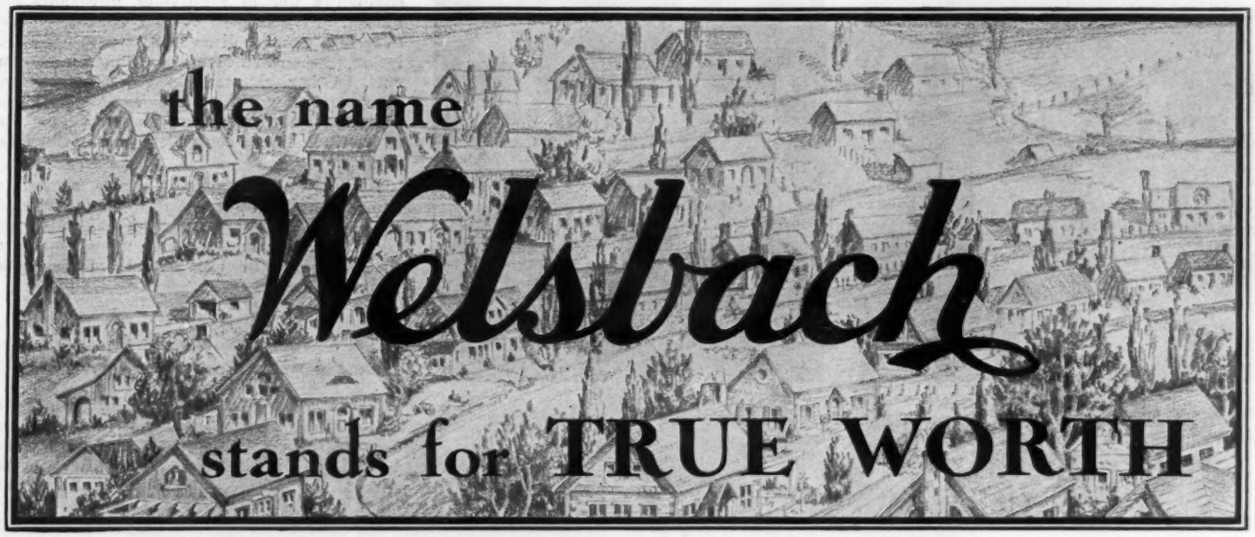
Three Companies in Hands of Receiver

A court order has been issued for the sale of the St. Paul Gas Co., the Savonburg Gas Co., and the Parsons Pipe Line Co., all of Chanute, Kan. Valuation of the properties of these three companies is said to be $250,000, with liabilities listed at $150,000. The companies pipe gas from the Neosho County field for industrial and domestic use. W. E. Murphy of Chanute has been appointed receiver of the properties.

9,000,000 c.f. Well Extends Field

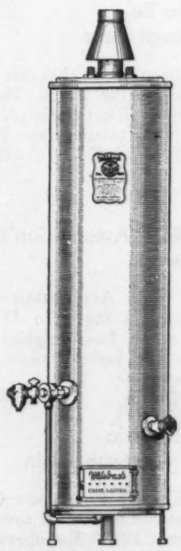
Western Natural Gas Co., operating in the Montana area, reports the bringing in of a 9,000,000 cubic foot well in the Sweetgrass Hills region. The new well extends the field about two miles.

in thousands of homes



in your business - it stands for **Profit!**

The fact that the design and style of Welsbach appliances have a definite appeal to the woman shopper, the fact that outstanding mechanical superiorities give her true and lasting worth and the fact that her familiarity with Welsbach performance is based on 40 years of Welsbach's recognized leadership—all are factors that create profitable sales for you.



Welsbach Water Heaters (*Hotzone and Stazhot*) are as noted for their favorable prices as for their beautiful appearance and full satisfaction.

Feature these famous products. Profitable sales are inevitable!

WELSBACH PRODUCTS

WELSBACH COMPANY

Factories: Gloucester City, N. J.

SALES OFFICES IN PRINCIPAL CITIES

50 Hawthorne St., San Francisco 226 So. Wabash Ave., Chicago, Ill.

AT LEFT: Close-up of cabinet of the new "Econoheet" space heater.
AT RIGHT: The heater in use.

New Model Econoheet Flueless Space Heater

THE Econoheet Co., Inc., of Chicago, Ill., has announced the manufacture of a new type flueless gas fired space heater which bears the seal of approval of the American Gas Association. Earlier models of the heater have been on the market for the past four years.

The heater's normal consumption of gas is 20,000 B.t.u. per hour with a rated heating capacity of 6,000 cubic feet of space on this amount of fuel. The new model uses a straight bar bunsen burner in a combustion chamber in which all gases are burned. A humidity of 40 to 50 per cent at a temperature of 68 to 70 degrees F. is maintained.

The combustion chamber is surrounded by a series of baffles or radiator shields. The theory behind this design is that the products of combustion, in leaving the combustion chamber, create a draft through these flues, drawing in cold air, which picks up the radiated heat from the combustion chamber and mixes it with the products of combustion before discharging into the room.

The new space heater heats entirely by convection, and is controlled either manually or by thermostat. The finish is burl walnut with black trim. It can be used as an end table or console, the radiation shields forming insulation for both top and sides.

Central Montana Utilities Completing Lewistown Survey

Central Montana Utilities Co., a subsidiary of the Minnesota Northern Power Co., Minneapolis, Minn., is going ahead with plans for construction of a 100-mile transmission line from Great Falls, to Lewistown. The line as surveyed, will pass through Belt, Raynesford, Stanford, Moccasin, Hobson, Moore, Hanford and other towns.

Cecil W. Smith, chief engineer for the company, has been in Lewistown recently, supervising the survey as well as planning construction of the transmission line and distribution system which will serve the town.

Asks Franchise at Bethany

E. E. Scofield has applied for a franchise for the service of natural gas at Bethany, Missouri.

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JOHN ZINK CO.
Oklahoma Natural Gas Bldg.
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TULSA, OKLAHOMA
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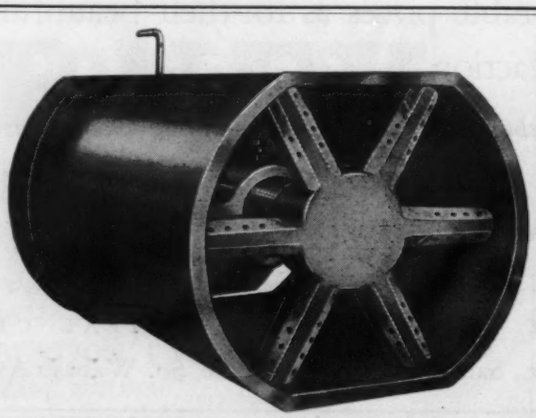
Flame Burners
Short Flame Burners



Catalog Featuring N.G.E. and Wilgus Lines

A new catalog has been issued by Natural Gas Equipment, Inc., of Los Angeles, Calif., featuring the design and specifications of the company's line of regulators, governors and valves. Five chapters of the book are given over to a general discussion of pressure regulation, illustrated with halftones and line cuts. Other chapters in the 60-page brochure are devoted to the various types of Wilgus regulators, governors and valves, and to N. G. E. liquid controllers and engineering service.

Blue printed installation charts, as well as camera studies of installations, are found in the publication, together with reference material. Copies may be had upon request to the company in the Petroleum Securities Building, Los Angeles.

P. G. and E. Building Line to Connect with Dudley Ridge Wells

Pacific Gas and Electric Co., San Francisco, Calif., began operations in February on construction of a line connecting the Dudley Ridge Oil Co.'s two gas wells with the company's main Kettleman Hills-San Francisco line. Pacific Gas and Electric Co. has contracted to purchase a minimum of 5,000,000 cubic feet per day from the Dudley Ridge wells, according to report.

The Dudley Ridge Co. has two wells producing a combined output of about 50,000,000 cubic feet per day, gas from these wells already serving Kettleman City.

15,500,000-Foot Well for Texas Gas Utilities Co.

Texas Gas Utilities Company has just brought in its largest well, with an open flow capacity estimated at 15,500,000 cubic feet per day, according to D. H. Tucker, vice-president of the company. The new well is on the company's Zavalla field holdings, and is the third large well to be brought in by the company since October, the other two having an open flow capacity of approximately 7,000,000 cubic feet per day each. The new well brings the company's total open flow capacity to approximately 75,000,000 cubic feet per day.

Franchise Election To Be Held March 9 at Great Falls

March 9, 1931, has been set as the date for a franchise election at Great Falls, Mont., to decide on the granting of a permit to distribute natural gas in that town to the Public Service Gas Co., of which E. B. Coolidge is president.

California Oil and Gas Association's Annual Banquet, Mar. 5

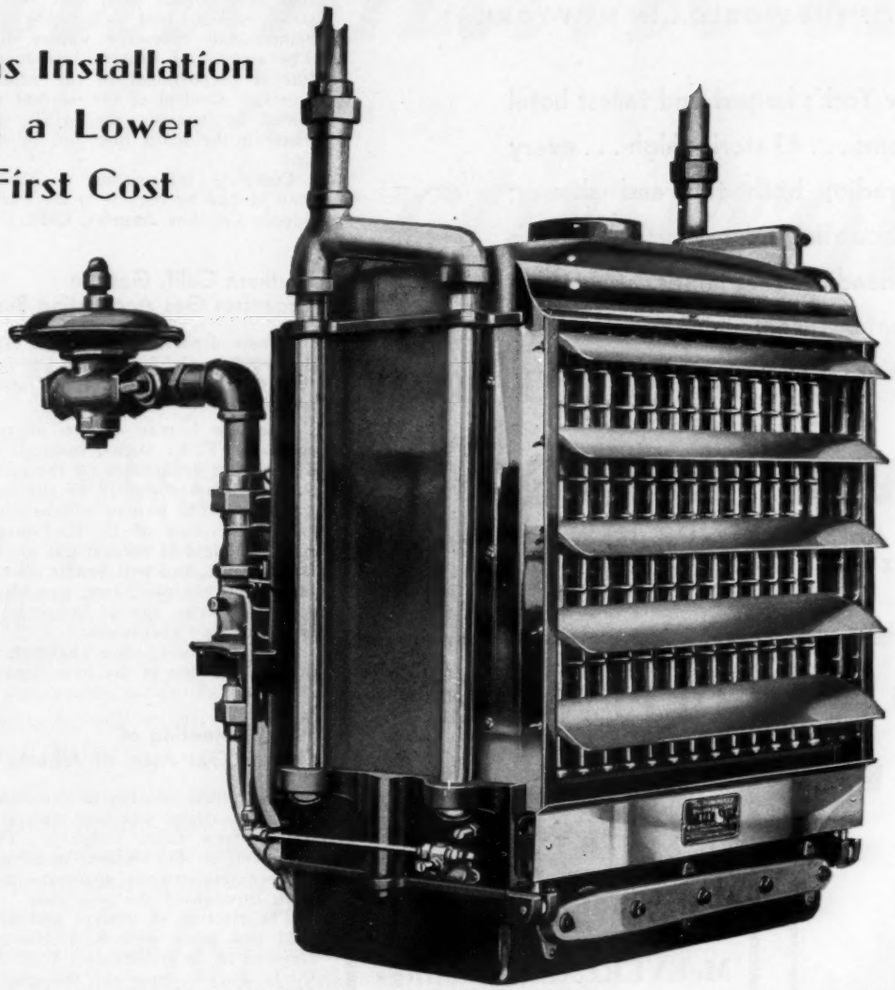
California Oil and Gas Association will hold its annual banquet in the Sala D'Oro of the Biltmore Hotel at Los Angeles on March 5, 1931. Governor James Rolph, Jr., will be the principal speaker.

Sioux City Gas & Electric Reports Operating Revenue Gain

Sioux City Gas & Electric Co., Sioux City, Iowa, reports a gain in net operating revenue of $105,319 for 1930 over 1929. Net operating revenue for 1930 was $1,342,305, as compared with $1,237,986 for 1929.

A New Angle of Approach

A Gas Installation at a Lower First Cost



IT BURNS GAS

With the introduction of the Humphrey Gas Unit Heater, the gas industry is provided with a new means of access to the industrial and commercial heating load. It shows not only lower operating costs than the average central steam plant, but can be installed at a lower first cost as well.

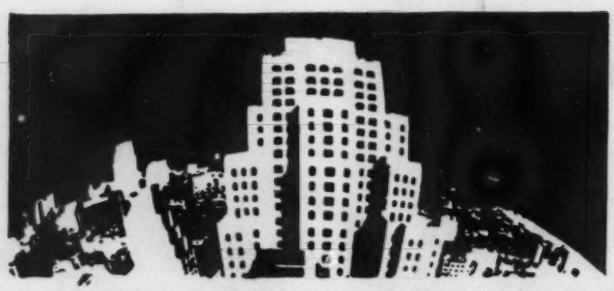
As a complete heating installation, or as flexible and easily controlled auxiliary heating equipment, the Humphrey Gas Unit Heater is without a rival. The large No. 200 is 2,000 B.t.u. input rated,—equivalent to 700 sq. ft. of steam radiation.

A HUMPHREY Product

made by GENERAL GAS LIGHT COMPANY

Kalamazoo, Michigan

C. B. BABCOCK, Pac. Coast Mgr., 135 Bluxome St., San Francisco



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THE NEW YORKER

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Write for circulars on automatic gas appliances.

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McEVERLAST Coatings
+Mechanical application
+Engineering service
=Complete,
Dependable
Protection

McEVERLAST, Inc.
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LOS ANGELES SAN FRANCISCO

Papico H. & K. Natural Gas Odorizing Equipment

The Pacific Pipe & Supply Co., Los Angeles, has recently placed on the market the Papico H. & K. natural gas odorizing apparatus.

The method of odorization is the automatic injection of odorant fluid into the gas line by means of the differential pressure obtained across an orifice plate. The apparatus is used in conjunction with the standard orifice meter installation. It consists of a storage tank, float valve chamber, strainers, sight feed, calibrating tube, odorant orifice, and necessary valves and fittings. The amount of odorant introduced into the line is proportional to the volume of gas flowing. Control of the odorant fluid is obtained by varying the orifice size of the discs in the main line and in the odorant line.

Complete information on the equipment may be had by request to the Pacific Pipe & Supply Co., Los Angeles, Calif.

Southern Calif. Gas Co. Organizes Gas Accounting Bureau

A new department has been organized by the Southern California Gas Co., Los Angeles, which will be known as the Gas Accounting Bureau.

The new bureau consists of two gas accountants, F. C. Skews, formerly of the gas dispatching department of the company, and P. A. Shimp, formerly of the auditing department. The bureau will be under the direct supervision of H. P. George, general superintendent of natural gas production and transmission, and will handle all matters pertaining to gas purchases, gas transportation, wholesale sales, special industrial sales, and inter-company operations.

Roy M. Bauer, office engineer, assisted in the organization of the new department.

Annual Meeting of Oil and Gas Assn. of Alberta

The annual meeting of the Alberta Oil & Gas Association was held January 27-31 at the Renfrew Club, Calgary. The retiring president, P. D. Mellon, spoke of the close cooperation between operators and government throughout the past year.

The election of officers and directors for 1931 took place with R. J. Hutchings being elevated to the presidency. P. D. Mellon and C. J. Yorath represent the gas production branch on the board of directors.

Joplin Gas Co. Has Display at Industrial Show

Joplin Gas Co., Joplin, Mo., offered an attractive display at the Seventh Annual Industrial Show sponsored by the Joplin Chamber of Commerce, which was held during the week of February 2. The new business department of the company displayed two late model ranges on a revolving platform. The Chamber of Commerce gave a late model Roper range as a prize in a drawing held on February 3.

Franchise in Chester, Mont., is Tabled Until April

The city council of Chester, Mont., has decided to postpone action on the natural gas franchise asked by both A. H. Perkins and the Northwest States Utilities Co., until April.

Industries want their gas *automatically controlled*

They'll switch to gas more readily when you give them all the facts

The advantages of gas alone are not your whole story in selling the industrial prospect.

He wants *automatically controlled* gas —at least he will when you open his eyes with the facts.

You sell him on the convenience of using gas. Automatic control makes it still more convenient and you will interest him by showing him exactly why and how.

He wants gas only if it will help him cut his production costs. Automatic control permits low costs not obtainable when boiler, oven and furnace temperatures are governed by hand or eye. Give him the facts.

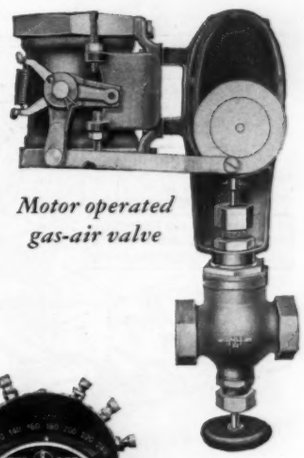
He expects gas to help him hold to high and uniform quality of output. Automatically controlled gas will give him the kind of uniformity that builds profits. Show him examples, facts.

For sales-building information on automatic control, gas companies are coming to Minneapolis-Honeywell. Minneapolis-Honeywell regulators have a proven record of reliability. The Minneapolis-Honeywell organization has amassed experience not found anywhere else.

A knowledge of these instruments and their applications will aid you in selling many an industry which is now only a prospect for gas.

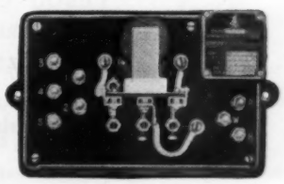
For full information, get in touch with the nearest office.

Minneapolis-Honeywell Regulator Co.
CALIFORNIA BRANCH
557 Market Street, San Francisco, Cal.
DISTRIBUTORS
Portland, Seattle, Salt Lake City, Denver



Motor operated gas-air valve

Temperature controller



Relay for the control of motor valves of large gas-fired furnaces

MINNEAPOLIS
HONEYWELL

Industrial Regulators

Extension from Sedalia Line Completed

CONSTRUCTION is announced as completed on the Cities Service Gas Co.'s 8-inch extension from the Sedalia carrier to Carrollton, Mo., with laterals serving Lexington and Marshall. Gas was turned into the mains at Carrollton on February 14, and at Concordia and Sweet Springs on February 17. Carrollton is a town of 4,058 population, and there have been 675 services sold and installed, while at Concordia, with a population of 1,140, and Sweet Springs, with 1,641, the percentage is about the same.

The Ozark Distributing Co., subsidiary of Gas Service Co., has purchased the franchises and physical properties of the Urban Service Co., holding natural gas franchises in Carrollton, Concordia, Sweet Springs, Hardin, Norborne, and Glasgow, Mo.

Franchises have recently been granted to the Gas Service Co. for service of natural gas at Alma and Emma, supply for Alma to come from the Lexington lateral. Emma is located near Concordia.

The city council of Blackburn, Mo., on February 5 granted the Ozark Distributing Co., headquartered at Kansas City, a franchise, and set the date for an election for Tuesday, February 24. Waverly was scheduled to hold a franchise election on February 20.

The extension, with laterals, will represent more than 80 miles of line construction, and will serve nearly a score of small towns.

Leslie M. King has been placed in charge of the properties formerly owned by the Urban Service Co., and will make his headquarters at Carrollton. His post as manager of new business activities at Falls City, Neb., of the Nebraska Distributing Co., has been taken by W. K. Morsman.

Fluor Announces New Features For Cooling Towers

The Fluor Corp., Ltd., of Los Angeles, Calif., manufacturer of Fluor cooling towers, announces that a number of new features have recently been incorporated in the Fluor cooling tower.

The following are some of the improvements: The primary distributing system on top of the tower has been revised so that in place of the old flume and troughs, a pipe system is now used in conjunction with a modification of the Fluor bowed type double paneled deck. This, it is claimed by the manufacturer, gives better distribution of water and requires no adjustment, since there are no troughs to get out of level, and the growth of algae cannot affect distribution.

Another feature of the new tower is that it offers maximum obstruction to the water which is trying to get out of the tower, and yet does not prevent free circulation of air. A complete and detailed description of the new Fluor tower will be forwarded upon request to the company.

Arkansas Natural Accident Prevention Work Brings Results

January 15 marked the first anniversary of organized accident prevention in the Arkansas Natural companies, headquartered at Shreveport, La. The company reports that accidents have been materially reduced. The following table gives the figures on accidents within the organization comparing 1929 and 1930:

Company	No. Accidents	Deaths
Ark.-La. Pipeline Co.		
1929	116	2
1930	40	1
Arkansas Natural Gas Corp.		
1929	93	2
1930	50	0
Arkansas Fuel Oil Co.		
1929	62	0
1930	44	0
Southern Cities		
1929	80	0
1930	23	0
Little Rock Gas & Fuel Co.		
1929	22	0
1930	12	0
Public Utilities		
1929	14	0
1930	5	0
Reserve Natural Gas Co.		
1929	13	0
1930	2	0

Electrolux Advertising Folios on Selling Apartment House Field

Electrolux Refrigerator Sales, Inc., Evansville, Ind., has recently brought out two advertising portfolios designed to assist the salesman in selling his customers in the small apartment house field on the advantages of gas refrigeration.

One portfolio is called Plan A, and represents a specialized selling plan to develop profitable small apartment business. It contains an outline of the plan, together with direct mailing pieces, sample order blanks, and a sample progress card.

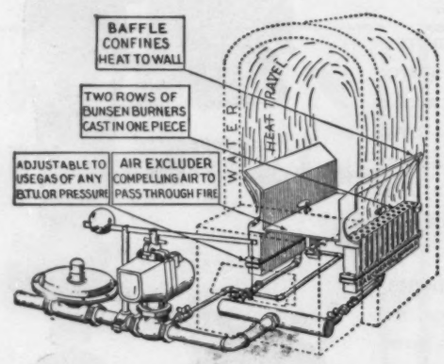
Plan "A" Data Book, taking for its slogan "How to Take Down the For Rent Sign", features two-color cuts of all the various Electrolux Models, together with small pasteboard cut-outs of the "Hostess" model. Photographs of apartment house installations are shown, and an explanation of the refrigerator's working principle, fully illustrated with half-tones.

Wahpeton Gas Co. Financing Additions and Betterments

Wahpeton Gas Co., Wahpeton, N. D., has been granted permission by the State Railroad Commission to sell 1,000 shares of common stock, no par value, and to realize $41,800 from the sale of preferred stock, par value $100, the proceeds to be used for additions and betterments to its system.

Gas Service for Moberly, Mo., By Middle of March

An 8-inch lateral is being built from Boonville, Mo., to Moberly, with gas service expected to start by the middle of March. Supply to come from the Missouri-Kansas Pipe Line Co.'s main line. Extensions are also under way to Jefferson City, Columbia, Louisiana, Bowling Green and Mexico, all in Missouri.


BAFFLE CONFINES HEAT TO WALL
TWO ROWS OF BUNSEN BURNERS CAST IN ONE PIECE
ADJUSTABLE TO USE GAS OF ANY BTU OR PRESSURE
AIR EXCLUDER COMPELLING AIR TO PASS THROUGH FIRE
WATER
HEAT TRAVEL

Perfect combustion correctly applied insures maximum efficiency

Noiseless, Sootless

Ideal for any size cast iron and fire-box boilers.

FAUCHER GAS BURNER, INC.
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PUBLIC UTILITY MANAGEMENT
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The staff includes the following who have been associated with successful nation-wide public utility enterprises for several years past.

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WHY

BARBER AUTOMATIC GAS BURNERS

Are Most Economical

MOST of the reasons for BARBER economy are unique and outstanding. They are the result of new principles developed by BARBER engineers. They make for easier selling and for far more satisfactory heating by gas, the ideal fuel.

First, complete combustion of every heat unit in the gas, coupled with a much higher flame temperature than ordinary burners, because of the two flames impinging and fed with the required amount of air. Only BARBER has this super-combustion principle burner.

The super-hot BARBER twin-flame.

Second, the BARBER principle applies the flame with a "scrubbing" action directly to the heating surfaces at the proper level of furnace or boiler so that all the heat is delivered to registers or radiators, without waste.

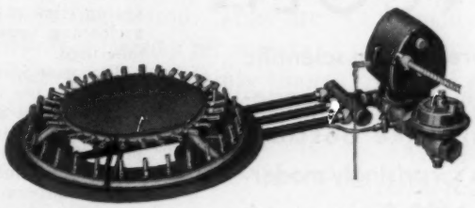
The flames are applied directly against the heating surfaces.

Third, the BARBER Gas Pressure Regulator which keeps the gas at an even, efficient pressure at the burners, thus preventing waste of gas.

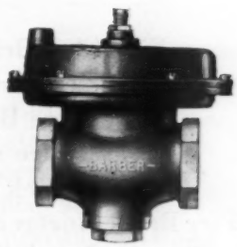
Last, the room thermostat which controls the burner operation to maintain the temperature you want, and so eliminates waste of gas through over-heating.

These make the cost of heating a home with gas compare favorably with the cost of coal. And with present low prices on fully Automatic BARBER Gas Burners, every medium size home in your community can afford to heat with gas.

Write for our catalog and special sales literature. We shall be glad to co-operate with you to the fullest extent.



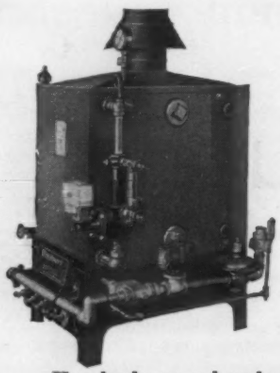
BARBER Automatic Gas Burner No. 330-B, with motor valve.



The BARBER Gas Pressure Regulator is a reliable and accurate precision device.

BARBER *Automatic* JET GAS BURNERS

THE BARBER GAS BURNER CO., 3702 Superior Ave., Cleveland, Ohio



The Pittsburg A Famous Boiler

The crowning engineering achievement in the gas boiler industry has been the design and perfection of the famous "Pittsburg" Boiler, the most advanced gas-fired house-heating boiler of the day.

Hundreds upon hundreds of installations have definitely proven the superiority of the "Pittsburg," achieving a fame that is rapidly spreading to all parts of the country.

Back of the design and construction of the "Pittsburg" Boiler rests the manufacturing resources of the worlds' largest water heater manufacturers—The Pittsburg Water Heater Company.

The "Pittsburg" label on these boilers is your assurance of the highest mechanical and engineering perfection, a service organization that extends into every town and city of any importance in the land, and an iron-bound guarantee of proven dependability.

Just as "Pittsburg" Water Heaters have demonstrated their superiority, so you will find "Pittsburg" Boilers rendering unsurpassed service wherever installed.

Write for booklet, prices and discounts.

"Efficient House Heating With Gas."
"Pittsburg House Heating Boilers."

Pittsburg Water Heater Company
Factory and General Office: Pittsburgh, Pa.
Offices in all principal cities.

Gladding, McBean & Co.

Refractories

"Best in the West"

Fire Clay Brick
Flint Clay Brick
Plastic Fire Brick
Ground Fire Clay
Ground Brick Dust
Fire Brick Mortar and Bond
Standard and Special Refractory Shapes
High Temperature Cements

Catalogue on Request

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Where modern scientific planning and management make possible rates surprisingly moderate. 1400 Rooms, each with bath and shower.

$3-5 For One $4-7 For Two

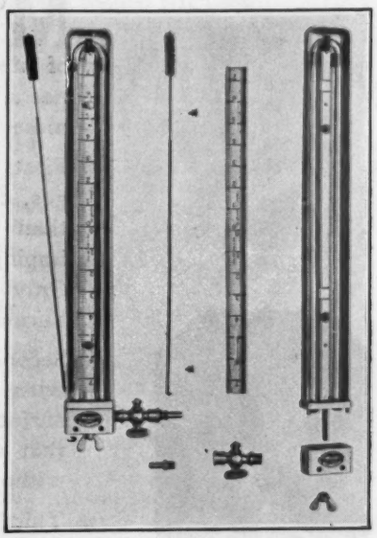
Telephone Lackawanna 1400

Eighth Ave., 44th, 45th Sts.
Times Square · NEW YORK

New U-Tube Manometer Announced by Meriam Co.

A new design of U-tube manometers and flow meters for measuring pressure or flow of liquids, steam or gas, is now on the market, manufactured by the Meriam Co., 1955 West 112th St., Cleveland, Ohio. A feature of this instrument is that it can be removed from the line for cleaning, replacement, etc., without unscrewing the pipe connections.

An instrument of this type consists of two separable parts—the head, which is permanently attached by the pipe connectors to the line; and the housing which carries the scale and tube, and which may be readily removed from the head by unscrewing a convenient



The diagram shows construction of head and upper part of housing in the new U-tube manometer.

wing nut. The top of the housing carries a threaded column which passes completely through the head-casting and serves to carry the wing nut.

The wing nut engages with a vertical stud in the housing, and serves to hold the two parts of the instrument in place. The rubber gaskets which keep the ends of the U-tubes pressure-tight fit into tapered holes in the head communicating with the pipe line, and thus a tension of the wing nut exerts compressive force on the gaskets to prevent leakage. Dowel pins tend to assure correct alignment of the head and housing. Spring clips at the back of the housing hold a cleaning brush suitable for the size of U-tube used.

The new instruments are particularly designed for use in cases where dirt is carried over from the pipe line into the instrument; or where for any reason it is desired to replace a broken tube, or to replace one instrument by another of different capacity.

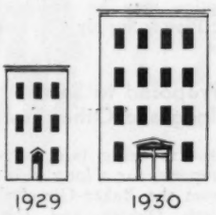
The instruments are designed to withstand line pressures up to 100 pounds per square inch, and may be supplied to measure any differential pressures up to approximately 50 pounds per square inch—or of course flows giving an equivalent differential.

Lampasas Franchise to Stevenson

F. D. Stevenson, Fort Worth, Texas, has been granted a franchise for the service of either manufactured or natural gas at Lampasas, Texas.

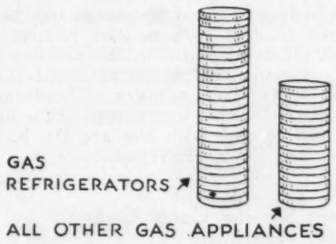
A tiny gas flame takes the *place of all moving parts*

What may you logically expect from GAS REFRIGERATION in 1931?



The number of gas companies actively selling gas refrigerators has practically doubled during the last twelve months.

Sales increases for gas refrigeration since its introduction in 1927 show phenomenal strides, including a 36% increase during the general business depression of 1930.



In more than one company today, gas refrigerator sales in dollar volume have already exceeded those of all other domestic appliances combined.

THE FACTS and figures given on this page are based on the annual report of the chairman of the A. G. A. committee on refrigeration. They are the result of a careful survey of twenty representative gas companies and indicate more plainly than words can tell what steady advances you may look for in gas refrigerator sales this year and in the years to come.

Progressive gas companies have been quick to grasp the immense load-building possibilities of Electrolux. Even the smallest Electrolux model increases your billing approximately 1500 cu. ft. monthly. Larger models proportionately more. Electrolux turns small "convenience" accounts into permanent large accounts . . . provides a strong impetus to the sale of other gas appliances.

We shall be glad to assist you in planning special refrigeration merchandising and sales drives for your community. Write, wire or telephone Electrolux Refrigerator Sales, Inc., Evansville, Ind.

ELECTROLUX THE *Gas* REFRIGERATOR

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

There are thousands of happy homes being heated Cleanly, Healthfully and Economically with Natural Gas ....thru the "Matchless"
Electrogas
FLOOR FURNACE
Proven economy and efficiency through ten years of service
see it demonstrated

ELECTROGAS FURNACE CO.
466 Sutter Street
San Francisco
Write for Attractive Dealer Proposition

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Reg. U. S. Pat. Office
U. S. and Foreign Patents Granted

WILLIAMS
GAS STEAM RADIATOR

Made in 22 sizes from 26 to 180 feet of rating.

IMMEDIATE HEAT **AUTOMATIC LIGHTER**

Improved Combustion. **Positive Gas Control.**

Write for descriptive matter and prices.

WILLIAMS RADIATOR COMPANY

1865-1873 Cordova St. **Los Angeles, Calif.**

One agent wanted in each of several cities

New Orifice Disc Housing Is Placed on the Market

Pacific Pipe & Supply Co. at Los Angeles announces the placing on the market of the Papico orifice disc housing. The fitting is a simple plate container provided with a locking device for holding the disc. This housing is used where the meter installation includes a by-pass. The advantages claimed are that orifice discs may be easily and rapidly changed without having to loosen and take out the many bolts of a pair of flanges and then spread them apart either with jack screws or wedges. This feature is of particular value where the line size is large or where the meter run is placed close to a wall or on the ground. The Papico housing uses the Robinson type plate. A complete description may be had on request to the Pacific Pipe & Supply Co., Los Angeles, Calif.

Line Proposed to Serve Winnipeg and Other Towns

Plans are being laid, according to recent press reports, for a long distance transmission line from the Baker-Glendive Field to cities in North Dakota and Canada, including Winnipeg.

The Capital Gas Corp., now merged with the Monarch Gas Corp., the Coulter Gas Corp., and the Jones Oil Co., reports that it now has completed wells producing 200,000,000 cubic feet of gas per day on various structures in northern and eastern Montana, and will begin franchising activities in North Dakota and Canada immediately.

John Wight of Billings, is president of the company.

Board of Natural Resources to Act as Advisory Body

A Board of Natural Resources has been appointed to deal with policies relative to gas and oil development in the province of Alberta, Canada, and to act as an advisory body to R. G. Reid, minister of lands and mines. R. J. Dinning is chairman of the new board, and serving with him are Dr. R. C. Wallace and Dr. F. A. Wyatt.

Western Service Corp. Gets Missouri Franchises

Western Service Corp., headquartered at Oklahoma City, Okla., has stated its intention of filing a franchise application at Osceola, Mo. Adrian and Appleton City, Montrose, Butler, El Dorado Springs, have voted the company franchises. The company has been granted a similar franchise at Deepwater.

Montana-Dakota Builds Gas Operated Power Plant

The Montana-Dakota Power Co., headquartered in Minneapolis, Minn., recently completed construction of a new power plant at Williston, N. D. The plant is operating on natural gas, and the present installed capacity consists of two 400-h.p. boilers and one 2,500-KVA turbine. It is expected to increase the capacity of the plant to 10,000 KW.

Gas at Lead, S. D., Is Odorized

Montana Dakota Power Co. has installed an odorization plant at Lead, South Dakota, using Calodorant as the medium.

ANNOUNCING A *Cooperative Advertising Plan for Dealers*

The actual size of this newspaper advertisement, reproduced below, is 10 columns x 17 inches.

To those who said,
"*We'll wait and see*"

Here's proof that *Natural Gas* cuts cost of Gas Heating

In the fall of 1929, Natural Gas was first served to San Jose and the cities along the San Francisco peninsula.

To prove that Natural Gas costs the cost of heating homes, we are publishing a few typical bills below and after the arrival of Natural Gas in those cities.

Costs less to heat with Natural Gas than other fuels

Anyone who works and frames to start a fire to keep warm is working for a few cents an hour! For that is the approximate cost of heating your home with Natural Gas and having heat at a finger's touch. In fact, it costs less to use Natural Gas than any other fuel.

Women especially appreciate the convenience of heating with gas fuel. There are no fires to build, no mess. For Natural Gas is the cleanest fuel. And when burned in modern appliances it is absolutely safe.

Come into our office or call a heating dealer and see the up-to-date heating appliances.

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned·Operated·Managed
by Californians
GAS HEATING DEPARTMENT

Throughout the year 1931 the Pacific Gas and Electric Company's gas appliance advertising will endeavor to "sell" all of the advantages of using gas fuel and will direct prospective buyers of gas appliances to Dealers' stores.

Already dealers are receiving many inquiries about modern gas appliances. Therefore, progressive dealers are availing themselves of our advertising schedules and "proofs" in advance of their publication.

Thus, dealers are able to prepare for prospective buyers by arranging window displays and sales plans to tie-in with this advertising.

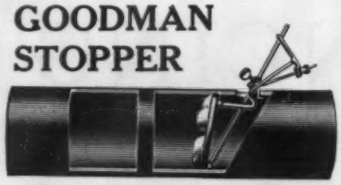
At your request, any of our Division Sales Managers will send *you* advance "proofs" and schedules of all cooperative newspaper advertisements. Phone or write to our nearest Division Sales Manager in one of the following cities:

City	Div. Sales Mgr.	City	Div. Sales Mgr.
Auburn	H. S. Furlong	Sacramento	L. J. Brundage
Chico	A. A. White	Salinas	P. S. George
Eureka	R. E. Wadleigh	San Francisco	Frank Talcott
Marysville	H. P. Humphreys	San Jose	J. S. C. Ross
Oakland	L. F. Galbraith	San Rafael	A. L. Walker
Red Bluff	H. A. Lee	Stockton	W. C. Schafer

PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned·Operated·Managed
by Californians

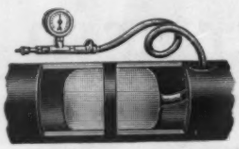
WG 3-31

THE
GOODMAN
STOPPER



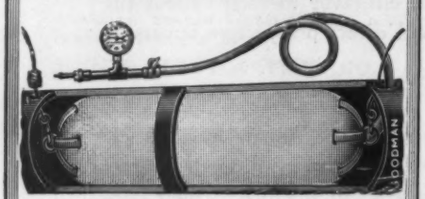
WHEN LOCKED IN PLACE IT HOLDS

DEPENDABLE GAS
MAIN BAGS



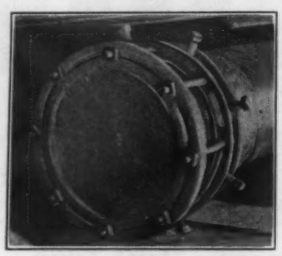
Type C

GOODMAN CYLINDRICAL
STOPPER FOR INTER-
MEDIATE PRESSURE



Increased Length for Increased Pressure

KRUPA-HENDRY
TEST CAP



For Testing High Pressure Lines

SHIPMENTS FROM STOCK

SAFETY GAS MAIN
STOPPER COMPANY

523 Atlantic Avenue
BROOKLYN, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street, San Francisco
California

CLASSIFIED ADVERTISING

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge.

SITUATIONS WANTED—MALE

Mechanical engineer and draftsman, experienced laying out, drawing plans and specifications for gas compressor stations and natural gasoline absorption plants; also several years executive experience, desires position with company needing qualified man. Applicant is 29 years of age. References and record of experience gladly given. Available on short notice. Address Box E-111, *Western Gas,* 124 West Fourth St., Los Angeles, Calif.

Gas engineer, experienced in commercial boiler and industrial kiln operation, seeks position. Mechanical and technical knowledge of fuel measurement supply, diffusion and consumption. Past three years sales and engineering of measurement and control devices to industrial consumers in Mid-Continent states. Address Box E-113, *Western Gas,* 124 West 4th Street, Los Angeles, Calif.

Gas compressor station engineer desires connection in West or Mid-West section. Applicant is 25 years old; married; has college education in engineering; has helped erect four natural gas compressor stations, 720 to 10,000 H.P.; and has been employed in these after completion without loss of time for 4½ years. Address Box E-109, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Man experienced in gas distribution desires position. Applicant is 29 years of age, has had 11 years' experience in consumers' complaints, installations and servicing, both industrial and domestic. Can furnish references. Experience has been in natural, manufactured and butane gas. Address Box E-115, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Auditor experienced in all branches of public utility accounting desires connection on West Coast. Applicant is 38 years old and has had 16 years accounting and statistical experience. Also qualified for office management or treasury department work. Now employed in Mid-Continent field in natural gas accounting. Address Box E-125, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Electrical and mechanical engineer with over 12 years experience in design, development and construction of heating appliances and automatic controls pertaining to same, familiar with shop practice and supervision of manufacturing as applied to the gas industry, seeks position. Address Box E-121, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Superintendent of measurement and distribution of natural gas desires new connection. Thirteen years experience in all branches of the gas industry, including production, transportation, measurement and distribution, both domestic and industrial. Technical graduate, employed at present. Married. Address Box E-123, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Distribution Engineer, age 34, with 8 years experience in designing, operating and maintaining distribution systems, desires managerial connection with small gas company or operating unit. Thoroughly conversant with technical and supervisory procedures, and well qualified in accounting and commercial practices. Responsibly employed at present with large western utility. Address Box E-117, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Appliance and service man familiar with change-over work desires position in gas company in California, Washington or Oregon. Has had experience on the Denver change-over, also at Salt Lake City and Springfield, Ill. Address Box E-119, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Recent Publications by Worthington Pump & Machinery Corp.

The following publications were released by the Worthington Pump and Machinery Corp., Harrison, N. J., during January. Copies will be sent on request to the company's publicity department.

D-711-S5; Power Vacuum Pumps, horizontal single double-acting; 4 pages. Supersedes D-92.

S-550-B2; Gas Engines, horizontal four-cycle double-acting, 36-inch stroke and over; 56 pages. Describes Worthington gas engines and gas compressors; gives pipeline tables, charts and formulas.

W-318-S2; Centrifugal Pumps, Type UA, two-stage volute; 4 pages.

W-318-S7; Centrifugal Pumps, Type UL, two-stage volute; 4 pages.

W-320-S1; Centrifugal Pumps, Underwriter fire pumps; 4 pages. Supersedes W-1074-B.

W-1200-B1; Worthington-Gilman rock drills and drill steel shop equipment; 4 pages.

Applies to Serve Wichita, Kan., With Natural Gas

George Austin Brown, representing natural gas interests, has filed an application with the city council of Wichita, Kan., asking for permission to supply that city with natural gas. Mr. Brown stated that his clients are planning to supply gas for domestic use at 25 cents at the city gate, and for industrial use at 13 cents, city gate rate.

Watertown Gas Co. Is Sold

The Watertown Gas Co., Watertown, South Dakota, was sold recently to the National Public Utilities Co. W. H. Hamill has been named manager for the company at Watertown.

Coast Counties Completes Industrial Conversion Job

Coast Counties Gas and Electric Co., of Santa Cruz, Calif., recently began serving the California Spray-Chemical Co.'s plant at Watsonville, Calif., the plant changing over to natural gas from fuel oil. An interesting feature of the plant is the tunnel dryer used for dehydrating sulphur compounds and copper carbonate, active ingredients used in the preparation of spray compounds. The kiln is fired by a number of drilled pipe burners which are controlled by a bank of valves located outside. A 120-h. p. boiler has also been converted to natural gas.

The plant will consume about 108,000 cubic feet daily.

Hanford, Calif., May Have "Dry Ice" Plant

Charles King of Hanford, Calif., is planning to erect a plant for the manufacture of dry ice. The ice would be made from natural gas, about 200,000,000 cubic feet of gas producing 2,000 tons of ice. Hanford's proximity to the gas fields makes it a logical location for the plant.

According to figures released by Mr. King, the ice could be produced and sold profitably at a cost of $10 per ton; using wet ice to ice fruit cars to New York costs approximately $90 per car, while with dry ice it would cost about $30.

Montana Pipe Line Co. Files Incorporation Papers

Montana Pipe Line Co. of South Dakota has filed articles of incorporation with the Montana commission. The company is capitalized at $505,000, and names as officers Henry M. Baskerville, Walter G. Baskerville, and Karl DeLaitre, all of Minneapolis. Offices are maintained at Great Falls, Mont., under the direction of Thomas L. Alford.

Debating Question of Gas Export From Alberta to Saskatchewan

Premier J. E. Brownlee of Alberta, along with his cabinet ministers, recently held a hearing on the application of the Tri-Cities Utilities for a permit to export gas from Alberta to Saskatchewan. The Government reserved its decirion until a later date.

Pacific Pipe & Supply to Distribute Hydrauger

The Pacific Pipe & Supply Co., Los Angeles, has recently secured the exclusive southern California distribution of the Hydrauger, a new boring tool which is essentially an air motor driven auger using water as an aid in making the bore.

Iowa Public Service Co. Ready to Serve Clarion

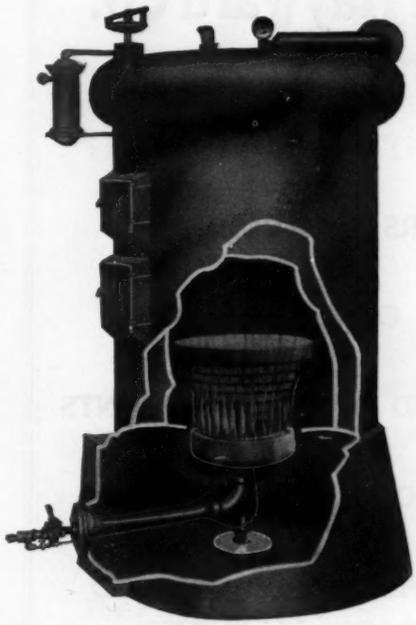
Clarion, Iowa, will probably receive gas through an extension from the major carrier of the Missouri Valley Pipe Line Co. Iowa Public Service Co., Sioux City, Iowa, is asking for a franchise to serve the town, which is about 20 miles from the main line.

Vinton Gas Co. Is Dissolved

The Vinton Gas Co., Vinton, Iowa, has been dissolved, following a meeting of stockholders held early last month.

MAXON

DOMESTIC CONVERSION GAS BURNER



Now Available Completely Equipped with Automatic Control

Sturdy and Simple Yet Attains Complete Combustion

THE ULTIMATE IN SIMPLICITY

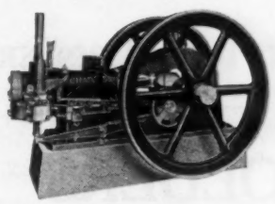
Telegraph or write for prices, capacities, publicity material to

THE MAXON PREMIX BURNER COMPANY

MUNCIE, INDIANA, U. S. A.

Increase Your Industrial Load With Natural Gas Engine Power

USED FOR:
Ice Plants
Cotton Gins
Pumping Plants
Laundries
Brick Plants
Electric Generating
Manufacturing Plants



Gas engines save over Electric Motors Steam Engines Gasoline Engines and Oil Engines. Their savings are so great you will be surprised.

WRITE US FOR FULL INFORMATION ABOUT THESE SAVINGS

CHARTER GAS ENGINE COMPANY - STERLING, ILLINOIS

Manufacturers of Dependable Gas Engines Since 1880

The

Bartlett Hayward Co.

Engineers and Founders

BALTIMORE NEW YORK

DESIGNERS AND BUILDERS
OF
COMPLETE COAL GAS PLANTS

CARBURETTED WATER GAS PLANTS

BY-PRODUCT PLANTS

DE BROUWER CHARGING AND DISCHARGING MACHINES

SALT WATER AND FRESH WATER CONDENSERS

PURIFIERS

SHAVING SCRUBBERS

CENTRIFUGAL VERTICAL TYPE SCRUBBERS

STEEL TANKS

VERTICAL WASTE HEAT BOILERS

GAS HOLDERS

DIRECTORY

Byllesby Engineering and Management Corporation

231 S. La Salle Street
CHICAGO

New York Pittsburgh San Francisco

SMITH-EMERY CO.
Chemists—Engineers
Established 1910
Analyses and tests. Represent Pittsburgh Testing Laboratory for inspection at Eastern foundries, mills and shops.
Offices & Laboratories
920 Santee St., Los Angeles
651 Howard St., San Francisco

REID AND BARTLETT
CONSULTING NATURAL GAS ENGINEERS
ATHLETIC CLUB BUILDING, DALLAS

PIPE
FOR EVERY
PURPOSE
JOS. GREENSPON'S SONS
IRON AND STEEL COMPANY
ST. LOUIS, MO. - TULSA, OKLA - NEW YORK CITY

If you would keep in touch with the Gas Industry developments in the West, send a check for $2.00 to

WESTERN GAS
124 West Fourth Street, Los Angeles

Name.....

Company.....

Position Occupied.....

Street Address.....

City and State.....

Subscription Rates: 1 Year $2.00; 3 years $5.00;
Foreign $3.00 per year

NEW DIFFERENT OUTSTANDING

Nothing else like it—with a beauty all its own. There is no other range to compare with

MOORE'S TWO-TONE TAPESTRY Gas Range

Every feature that has made Moore Ranges famous has been incorporated in this new range. And the artist designers have made it beautiful beyond description. There is no way to picture or describe it in a fitting way. It must be seen.

Here is an Unparalleled Opportunity for Immediate Sales and Profits

TAKE ADVANTAGE OF IT

Write or wire *now* for one of these ranges or send for complete details.

MOORE BROTHERS COMPANY
JOLIET
ILLINOIS

Since
1857

UNUSUALLY SENSITIVE CONTROL

—for—

High Pressure Gas Transmission

CF

The Fulton Duplex Sensitive Gas Governor is designed to meet the needs of natural or manufactured gas companies who desire to control a high and varying inlet pressure and reduce it to a low and unvarying outlet pressure for illuminating or fuel purposes. The power to operate this governor is derived from two diaphragms of equal area, moving in opposite directions, but transmitting their power in the same direction. This gives a vast increase in sensitiveness and power over that possessed by a governor with a single diaphragm.

The governor is easily and quickly installed, and due to the simplicity of its construction, requires but little attention afterward.

Catalogue on Request

The Chaplin-Fulton Mfg. Co.

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes, From 1 Inch to 24 Inches; For All Service. 1 oz. up to 2000 lbs. Pressure to Square Inch.

28-40 Penn Ave. **Pittsburgh, Pa.**

REPRESENTATIVES:

WESTCOTT & GREIS, Inc.
Sales and Service
Dallas—Los Angeles
Tulsa

JNO. W. CRAWFORD
Sales Engineer
1855 Industrial St.
Los Angeles

Or Any Jobber

Doublex Simplex Joint: when this laborer centers the spigot and tightens the bolts, the joint is completed!

Especially Designed for Higher Gas Pressures

DOUBLEX SIMPLEX

centrifugal cast iron pipe

ACIPCO'S Doublex Simplex pipe introduces the permanence, dependability and laying economies of centrifugal cast iron pipe into high pressure gas lines. This new pipe is manufactured by the world-famous Mono-Cast centrifugai pipe process. Cast under high centrifugal pressure, it is homogeneous throughout its entire length, fine grained, dense in structure and free from inclusions and casting strains. Composed of iron only one degree removed from its natural state, it is highly resistant to corrosion. The Doublex Simplex Joint, as shown in accompanying illustration, employs the stuffing box and gland principle. The friction grip of the gasket against the surfaces of the pipe gives a tight joint against separation and leakage even at extreme high pressures. The size and bulk of the gasket allows unusual joint deflection and ample provision for expansion and contraction. Although a comparatively new addition to the Acipco line, Doublex Simplex high-pressure pipe is already in extensive use throughout the country. Write nearest Acipco office for specific literature, prices, etc.

AMERICAN

CAST IRON PIPE COMPANY

BIRMINGHAM, ALABAMA

BRANCHES: New York City, Chicago, Minneapolis, Kansas City, Cleveland, Detroit, Dallas, San Francisco, Los Angeles, Seattle.

THE CLEVELAND BABY DIGGER

In One Compact Digging Unit

Utility—Quality—Efficiency—Service

THE Cleveland Baby Digger, incorporating as it does in one COMPACT, efficient unit, SPEED, MOBILITY, STRENGTH, POWER and ECONOMY OF OPERATION, enables you to meet quickly and satisfactorily the ever-changing conditions present in the digging of gas trench.

If the trench is for a long line, the Baby Digger, with its wide range of speeds, assures fast, uninterrupted performance.

Carrying no excess tonnage, the Baby Digger, exceedingly mobile, is quickly and easily moved from location to location, on its special trailer, thus reducing the unproductive time and assuring the advantages of machine digging on the many short-extension jobs.

Precision built of the finest quality, best-adapted steel, its ruggedness and strength are unsurpassed and more than amply powered, it digs through the toughest and hardest soils.

Extremely compact, only 58 inches wide, it operates easily in the most confined areas, thus enabling you to secure all the advantages of machine trenching on over 95 per cent of your jobs.

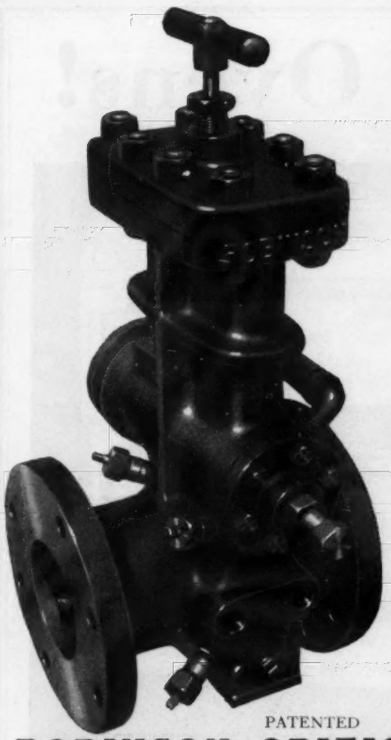
Because of its availability and usability, the Baby Digger is a wise and profitable investment. Write today for full information.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Ave. Cleveland, Ohio

THE CLEVELAND BABY DIGGER



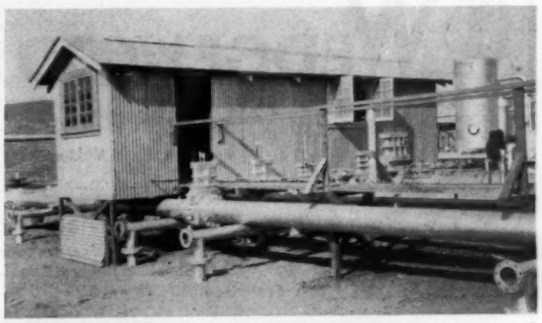
TAKE NO CHANCES....

Don't gamble with your metering. Errors are too costly! Be SURE of ACCURACY by installing ROBINSON ORIFICE FITTINGS on your Oil Field, Refinery or Transportation lines.

But ACCURACY is only one advantage of ROBINSON ORIFICE FITTINGS. There are many others. For example: Plates can be changed in a very few minutes. No expensive extracting of plate from between flanges. Ease of plate removal and replacement allows frequent inspection and checking. No delay in adapting the meter to a changed flow condition.

No gas loss, because there is no by-pass valve to stick open and leak. Positively no leakage past plug is possible. Each ROBINSON FITTING must pass under water air test and Hydrostatic test of double its rated working pressure.

Complete installation can be made in a short time, and there is a great saving in materials because ROBINSON advanced design does away with practically all valves, tees, ells, couplings, flanges, pipe, etc.



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ROBINSON ORIFICE FITTING CO.

1435 Santa Fe Ave., Los Angeles, Calif., U. S. A.

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Walker, Crosweller & Company
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London, S.E. No. 1

CANADIAN DISTRIBUTORS:
Peacock Brothers, Limited Montreal, Calgary, Winnipeg

DISTRIBUTORS:
The Foxboro Company—Foxboro, Mass.
Chicago, Dallas, Houston,
Los Angeles, Pittsburgh, Tulsa

Westcott & Greis, Inc.
Dallas, Houston, Los Angeles, Tulsa

See our Exhibit at the Oil Equipment & Engineering Exposition, March 16-22

This New Ray-Glo

Sensational New Values

RAY VITALITE GLO

Radiant Gas Heaters

The **"Challenger"**

A handsome ANDIRON model.

Offering, at an unheard-of low price, the same high heat intensity and complete combustion for which Ray-Glo is so widely known.

With the unique "fixed mix" burner and other exclusive features, Ray-Glo has won a standing as "the best that is made."

Now prices on these famous heaters are sharply lowered, while Ray-Glo's high standards of precision and quality are unchanged.

The line has been extended to offer handsome new models even far down in the low-price field! Ray-Glo now includes also "the cheapest that is good."

RAY-GLO CORPORATION

ATHENS, OHIO

Six Burners—Two Ovens!

Ivory Porcelain With Black Trimming

May also be had in green and ivory porcelain

This handsome six burner, double oven gas range should be in many homes where inadequate cooking equipment is now in use.

It offers capacity, efficiency, beauty and the cleanliness of gas cooking. Stainless, rust-proof enameled cooking top. Sectional cast combustion plate. Porcelain rust-proof removable linings in both ovens and broiler. Large utility drawer and upper warming oven. Flush front, concealed manifold. Heat Control in upper oven and Rutz Lighter.

WEDGEWOOD

"The Cooking School of the Air"

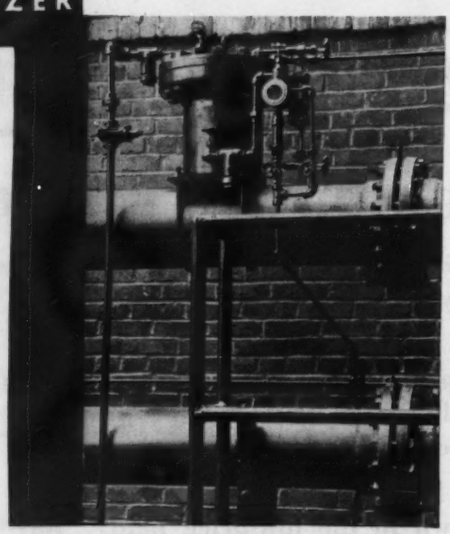
Tune in on these Wedgewood Programs
Every Friday at 10:50 A.M.
KGO—KPO—KFI—KFSD—KGW—KOMO—KHQ

James Graham Manufacturing Co.
Largest Stove Manufacturers in the West
The all-inclusive Gas Line
San Francisco Newark, Calif. Los Angeles

Over a Million Satisfied
Wedgewood Users!

PAPICO
H&K
GAS
ODORIZER

Natural Gas *MUST* be Odorized



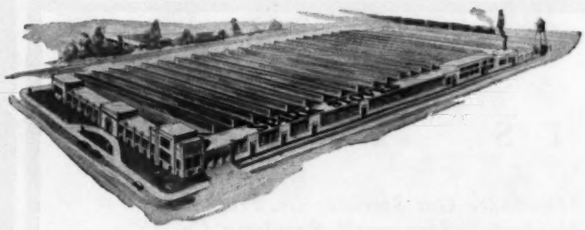
Natural gas distributed for domestic and industrial consumption must be odorized to guard against escaped gas explosions. Distribution without such protection is hazardous. The PAPICO SYSTEM of odorization effectively and economically treats gas without interrupting the flow. This method gives a uniform, accurate injection of thoroughly atomized odorant, automatically introduced in amounts directly proportional to the flow. Ask for complete information.

Other Papico Products Include: Orifice Discs and Meter Assemblies; Flow Tubes for use with Self-contained Fittings; Multi-tube Straightening Vanes; Perfection Duplex Mercury Traps.

See our exhibit at the Oil Equipment & Engineering Exposition . . . Los Angeles, March 16 to 22 Booth 215

PACIFIC PIPE & SUPPLY COMPANY

1002 SANTA FE AVENUE PAPICO LOS ANGELES, CAL.



The Hammer-Bray Company's immense new Plant at East 14th St. and 102nd Ave., Oakland.

Hammer-Bray Co.

Manufacturers of Spark Lid-Top Gas Stoves—Gas Circulating Heaters and Other Gas Cooking and Heating Appliances

OAKLAND CALIFORNIA

Los Angeles, 7000 Avalon Blvd.; San Francisco, 180 New Montgomery; Portland, 330 Union Ave., No.; Seattle, 1016 1st Ave., So.

DO NOT FAIL

to See the

APRIL ISSUE

of

Western Gas!

THE most important announcement of new gas appliance merchandise that has been made for years will be published next month in this magazine, over our signature.

It will pave the way to create an increase of immediate and profitable business. It is a new line of merchandise so outstanding in its unique superiority and modern beauty as to solidly fortify the dealer or utility displaying it in the good will of his patrons.

* * * * * *

Watch for the four-color SPARK announcement in April Western Gas.

Sprague Semi-Chrome Leather

Resists Acids and Boiling Water

Now Used in All

Sprague Meters and Regulators

After

Five Years' Tests and Experiments

May we send you samples and data?

The Sprague Meter Co.

BRIDGEPORT, CONN.

Los Angeles, Calif. San Francisco, Calif. Newark, Ohio Davenport, Iowa Houston, Texas

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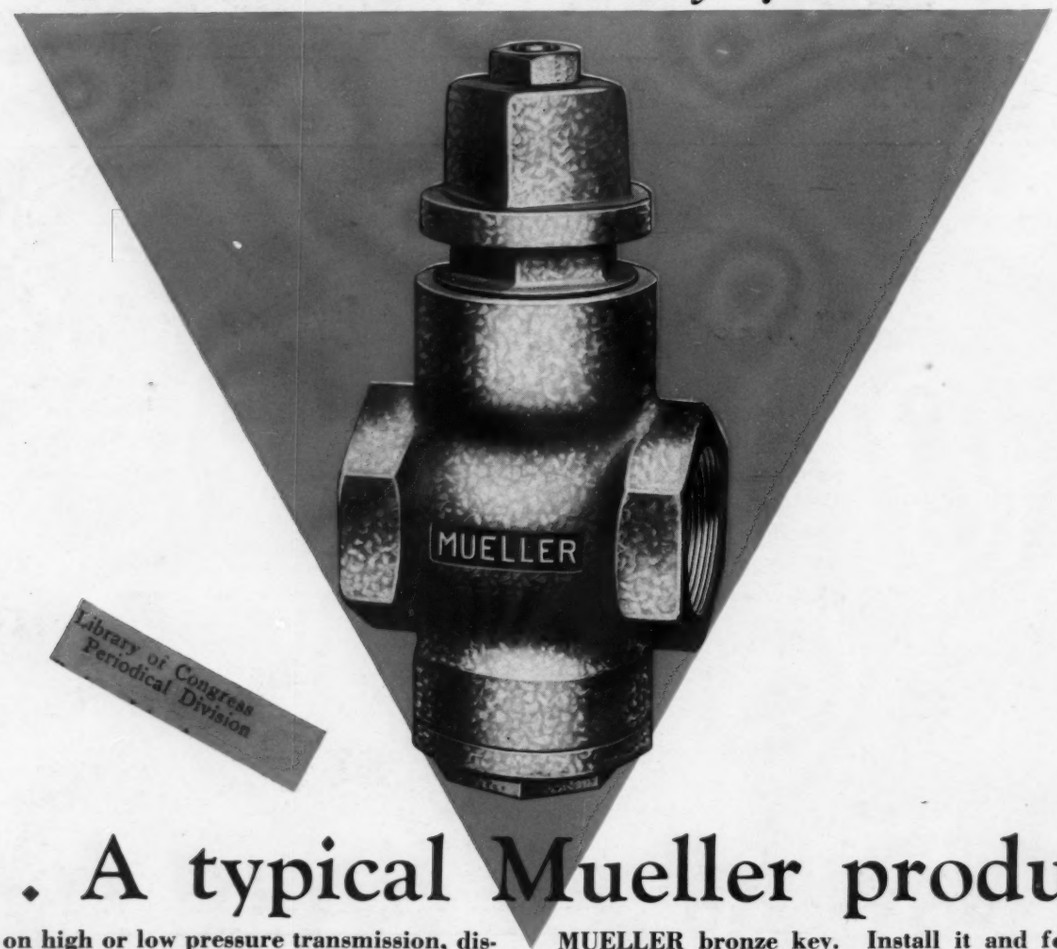

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